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ABSTRACT

This document is a pretrip instruction manual that can be used by secondary school and college teachers who are planning trips to visit the tropical habitats in South Florida. The material is divided into two parts: (1) several fact sheets on the various habitats in South Florida; and (2) a number of species lists for various areas. Factsheets on the classification of marine environments, the zones of the seashore, estuaries, mangroves, seagrass meadows, salt marshes, and coral reefs are included. The species lists included algae, higher plants, sponges, worms, mollusks, bryozoans, arthropods, echinoderms, vertebrates, insects, and other invertebrates. The scientific name, common name, and a brief description are supplied for all species. Activities on the behavior and social life of fish, a dichotomous key for seashells, and a section that lists useful references for Florida field trips are included. (KR)

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A PRETRIP TRAINING MANUAL FOR:

EXPERIENTIAL TRAINING IN FLORIDA and the FLORIDA KEYS

ED341547

PART OF:

AN INTERACTIVE FIELD BIOLOGY PROGRAM CONSISTING OF PRETRIP INSTRUCTION, SEARCH IMAGE TRAINING, FIELD EXERCISES, AND OBSERVATIONS OF TROPICAL HABITATS AND CORAL REEFS

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Notes to the user of this material.

The instructional materials developed for the field course are part of an award winning presentation for instructional development. The couse guidelines were rearranged and submitted previously to the ERIC database. Copyrighted figures and certain other materials have been removed from this document..

The resulting pretrip instruction manual, however, can be used by secondary schools and college teachers who are planning trips to visit the tropical habitats in South Florida. The material is divided into two parts: (1) several fact sheets on the various habitats in south Florida and (2) a number of species lists for the various areas that we personally have visited.

In our own pretrip classes prior to departure, we use search image slide training to teach our students the major floral and faunal elements of south Florida . We also have video tapes of many of the habitats for students to peruse. While in Florida, we use the included checklists to summarize the elements that we see. These checklists are in a computer database; so we can update them every year. We also have a pretrip examination covering the material on the fact sheets.

When we travel to Florida for our field class, we normally take an extensive field library with us. These field guides are extremely helpful and many students delight in identifying additional organisms. We have included a suggested Florida-oriented library in the back of the instruction manual. Since many of these books are published by local Floridean companies, they may be difficult to locate. We suggest that individuals wanting a current list of what is available should contact: Mickler's Floridiana, Inc., P.O. Box 1450 Oviedo, Florida 32765. This is a company which specializes in Florida material. They offer a healthy discount for educational institutions.

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L303--FACT SHEET

CLASSIFICATION OF MARINE ENVIRONMENTS

ECOLOGY is a complex subject. A proliferation of terms prompted a committee to develop a standardized classification of marine environment.

The **OCEAN** is divided into **TWO** main divisions:

1. PELAGIC 2. BENTHIC

Pelagic--open water or whole body of oceanic water.
Benthic--bottom region.

PELAGIC REGION is further divided into:

1. NERITIC PROVINCE
2. OCEANIC PROVINCE

Neritic--Water that overlies the continental shelf.
Oceanic--Beyond the continental shelf in the open ocean.

PELAGIC REGION is, because of varying conditions with depth, divided into several layers or zones.

1. **EPIPELAGIC--0-200 METERS**
2. **MESOPELAGIC--200-1000 METERS**
3. **BATHYPELAGIC--1000-4000 METERS**
4. **ABYSSOPELAGIC--4000-6000 METERS**
5. **HADOPELAGIC-->6000 METERS**

BENTHIC DIVISION is divided into the following zones.

1. SUPRALITTORAL SPRAY ZONE--Above the high tide mark where the ocean is affected by salt spray from the ocean. Sometimes called the spray zone.
2. LITTORAL OR INTERTIDAL--The littoral lies roughly between the mean high tide and the mean low tide. Since the tide is out roughly half the time, the organisms living here are adapted to varying degrees of stress and exposure. This is the best studied marine zone.
3. SUBLITTORAL--A familiar zone because it corresponds to the Continental Shelf; Not well studied close to shore. From mean low tide out to a depth of 200 meters.
4. BATHYAL--The sides of the ocean basins down to a depth of 4000 meters. Environment is variable with very deep being

characterized by oozes formed from the skeletons of microscopic organisms. The upper section is very much like the littoral.

5. ABYSSAL--Essentially the bottom of the ocean. Virtually 1/2 of the earth's surface is covered by this zone from 4000 to 6000 meters.

6. HADAL--Located in relatively narrow slits called **trenches.** Often associated with the island arcs and volcanic activity. >6000 meters.

L303--FACT SHEET

SUPRALITTORAL ZONE

This is the spray zone above the high tide.

ANIMALS OF THE SUPRALITTORAL

The common snail found on mangrove branches and high on the rocks is the angulate or mangrove periwinkle. These snails can withstand long periods of desiccation. The other snail found on the fringe is the beaded periwinkle. Another group of animals common here have hard exoskeletons to help prevent drying. These crustaceans include arthropods like land crabs, amphipods, and isopods.

Obvious in Florida is the ghost crab-***Ocypode***. Burrows can be seen all along the sandy beaches.
Others--terrestrial hermit crabs like ***Coenobita***, land crabs like ***Cardiosoma***, the isopod--sea roach, ***Ligia***, the beachhopper-***Orchestia***, an amphipod. Isopods have abbreviated or direct development. All are still tied to the ocean for breeding.

PLANTS OF THE SUPRALITTORAL

Many plants are able to survive in the harsh environment of the supralittoral.
Beach and dune grasses--the dominant temperate species is American beach grass, ***Ammophilia breviligulata.*** This grass requires burial by sand for continued growth; can be covered a meter or so. Highest coastal dunes in the world along the Great Lakes are stabilized by American beach grass.

The Florida and tropical counterpart is sea oats, ***Uniola***. This plant is not as effective a trap as beach grass, but they do protect against erosion. Therefore, they're protected now because in the past they were used by the little old ladies for dry plant arrangements. Other Florida forms in this area include: sea purslane, seagrapes, sea oxeye, beach morning-glory, saltwort, Spanish bayonet, railroad vine, prickly pear cactus and many others. The conspicuous exotic species on the dunes is ***Casuarina*** , the Australian pine. Currently, attempts are being made to remove this shallow rooted tree.
The dune is the major protection against storm surge. Rooted plants help keep the dune in place. *No major sand dunes are present in the Keys!*

L303--FACT SHEET **THE SEASHORE--LITTORAL ZONE**

Rachel Carlson, in her book the **Edge of the Sea**, described the low tide line as "the primeval meeting place of the elements of earth and water, a place of compromise and conflict and eternal change." Understanding comes when we can sense the long rhythms of the earth and sea that sculpted its land forms and produced the rock and sand of which it is composed.

1. **Rocky, sandy, muddy shore types.** These are all subjected to alternate submersion and exposure by the tides.

2. Organisms are adapted to withstand **exposure to the air**. High tide--a water world; low tide--a terrestrial with extremes in temperature and moisture.

ROCKY INTERTIDAL

The rocky intertidal is an "action zone" between the tides which may feature a low diversity of organisms with **high numbers of selected species**. Physical factors include twice daily changes in pH, salinity, temperature, light, etc.

The uppermost layers near the high tide mark are exposed to the widest ranges in exposure to air, temperature fluctuations, intense solar radiation and desiccation. The lowest fringes may only be exposed briefly. This range results in the often noted **zonation of organisms**-the most striking feature of the rocky shore.

Characteristic features--1. Zonation--Stephenson's classical zonation. Read section from Life Between Tidemarks. 2. Few species generally found in great abundance. 3. Difficult living conditions-exposed on the rocks is the worst place (pounding of the waves), but more niches here--in cracks, crevices, holes, under the rocks, boring into rocks, and tidal pools.

Factors affecting zonation--Physical and Biotic.
Physical include temperature, force on waves, and most importantly exposure.
Temperature change is severe. Ocean--66-88 F; on the rocks 45-100 F.
Biotic factors--The usual factors like competition, predation, and grazing, but also involved are biochemical pathways like the enzyme systems.

L303--FACT SHEET--**SANDY SHORES**

Many ocean shores have sandy beaches subject to the full force of the ocean. Actually, they are part of a continuum of particle sizes ending with muddy shores. On the open sandy beach, physical forces and migrating substrate produce an inhospitable environment, but some organisms have been remarkably successful in colonizing the sand.

FEW PLANTS LIVE HERE; ALMOST ALL ANIMALS ARE BURROWERS.

SANDY BEACHES are strongly heterotrophic, meaning the organisms get their energy or food from decomposing organic material--detritus. This may be transported in as beach wrack during high tide or water may drain off the beach or be transported in from rivers.

THE FLORIDA KEYS HAVE FEW SANDY BEACHES. LITTORAL DRIFT OF SAND ENDS AT KEY BISCAYNE AND VIRGINIA KEY NEAR MIAMI, FLORIDA.

A typical Floridian beach profile might include: ghost crabs along the upper edge (most common tropical supralittoral beach form). Ghost crabs are good scavengers--actually increasing in areas of human activity. The mole crab, ***Emerita***, and the coquina, ***Donax***, are the common forms in the swash zone. Whiting, pompano, and sand drum follow waves in to feed on the worms, crabs and snails are found in the surf zone. Adaptations include smooth shells and reduced spines. Worm rock is found on the sublittoral fringe along Florida's east coast.

Things drifting into the shore include boards, plastic bottles, Portuguese man-of-war jellyfish, by-the-wind-sailor jellyfish, sargassum or gulfweed and little old ladies picking up shells.

L303--FACT SHEET--**MUDDY SHORES**

MUDDY SHORES, located in secluded areas away from the pounding of the ocean in enclosed bays, lagoons, harbors, and estuaries, have little slope and are thus appropriately referred to as mud flats. Little or no wave action yields to deposition of smaller particles. Lack of water movement beneath the surface leads to decomposition and oxygen uptake leading to anaerobic conditions. The smell of life is H_2S and FeS.

The mudflat surface sometimes looks barren with millions of holes. Scientists have suggested that production is transported from elsewhere. The problem is that the highly nutritious algal biomass is rapidly converted into animal flesh. The invertebrates are then preyed upon by a variety of birds, crabs, and fishes.

ADAPTATIONS OF ORGANISMS IN THE MUDFLAT
Burrowers and organisms with permanent tubes. Crabs have light bodies and long legs. Clams, to fight acidic conditions, have a thick organic periostracum. Physiological adaptations for low oxygen tension.

FEEDING BIOLOGY

Deposit Feeders--***Arenicola***--lug worm, ***Capitella***, a polychaete, and ***Macoma***--a bivalve. The lug worm has a permanent u-shaped burrow where it pulls mud in one end and deposits feces on the other. The polychaete moves through the mud. The bivalve uses its siphons like a vacuum cleaner.

Suspension Feeders--***Chaetopterus***, the parchment worm lives in a parchment-like tube sticking about 1/2 inch above the surface. It sucks water in and traps the goodies in a mucous ball.

Predators--Fishes when the tide is in; birds when the tide is out. Crabs are scavengers. Although there are a lot of plants, herbivores are few.

In Florida, extensive portions of the shallow Gulf Coast, Florida Bay, and the Intracoastal are covered with only a few inches of water at low tide. Other organisms here include the razor clam, ***Tagelus***, the quahog, ***Mercenaria***, young stone crabs, ***Menippe***, common mud crabs, ***Panopeus***, common mud snails, ***Nassarius***, hermit crabs, and a number of polychaetes.

L303-FACT SHEET--**ESTUARIES**

ESTUARIES are coastal areas where mixing with fresh water occurs. In Florida, estuaries comprise a complex system including wetlands, grasses, mangroves, oyster bars, sand, mudflats, and algae or seagrass meadows covering millions of acres. They are an immensely valuable resource (nursery and spawning ground, buffer against storms, recreational area, a detritus food source for offshore), but unfortunately they are a target for development and the release of effluents.

Tidal flux produces changes in salinity. Therefore organisms have a problem with osmoregulation. Abundance of true estuarine species is consequently restricted to euryhaline fishes like sardines, anchovies, seatrout, redfish, mullet, snook, tarpon, menhaden and several others. The importance of estuarine habitats is emphasized by the fact that 97+ percent of total Gulf of Mexico fisheries catch is comprised of species that are dependant on estuaries **during some phase of their life cycle**. Most are spawned offshore migrating into the estuaries where their juveniles use a variety of habitats. Commercial pink shrimp grow up here too.

In northern climes, ***Spartina*** or cord grass is a major detritus contributor. In Florida, manatee grass, turtle grass, shoal grass and eel grass, ***Zostera***, are major contributors. Florida Bay is dominated by innumerable mangrove islands and mangrove forest fronting extensive marshes on the mainland. Red, black, and white mangroves inject significant energy into the system.

Florida contains over 1,300 miles of marine coastline. Adjoining the Gulf of Mexico are over 3,000,000 acres of estuarine water (11 major systems) which may vary in size from a few acres to a few hundred square miles. Many estuaries here are classical in the sense that they have pronounced salinity gradients. On the east coast, the open ocean is characterized by a high energy shoreline with some 18 river mouths and inlets into the back-barrier system. The St. John's River is the major estuarine river system on the east coast. The remainder of the system is characterized by estuarine lagoons with poor circulation. See the attached figure for a list of Florida's estuaries.

Shell mounds and oyster middens left behind by the Indians testify to the historical dependence upon the resources of the estuaries. Now this has grown to encompass commercial and recreational elements. Dominant estuarine-related species include: mullet,

spotted, sea trout, snook, pink shrimp, red drum, blue crabs, and oysters. The center of the oyster fishery is Apalachicola Bay. Crabs are harvested from the "Big Bend" area of the northeast Gulf of Mexico, from southwest Florida, and northeast Florida to the Georgia border. Smaller commercial pink shrimp taken from estuaries are often harvested and sold as bait shrimp.

L303--FACT SHEET--NERITIC PROVINCE, BENTHIC DIVISION
SUBLITTORAL ZONE

The ocean is the reason why we visit Florida. Coupled with the warm tropical flow of the Florida Current, the ocean is responsible for the moderate climate. Florida has over a thousand miles of coastline, and **60,000 square miles of continental shelf**. These neritic waters may be divided into nearshore waters heavily influenced by freshwater inflow and those waters further offshore affected by inshore coastal water and offshore oceanic water. Oceanic water off Florida in the area of the Keys and the southern portion of the peninsula is influenced by the Loop Current and the Florida Current. After going through the Florida Straits, the Florida Current maintains a close proximity to land until it reaches the St. Lucie River area where the land mass angles westward.

Demersal or benthic habitats are those associated with the bottom. **A greater variety of benthic habitats occurs in the marine waters off Florida than anywhere in the United States.** These include: sediment areas, seagrass meadows, live bottom, ***Oculina*** coral reefs, worm rock reefs, vermetid worm snail reefs, tropical coral reefs, and numerous artificial structures like ship wrecks. These sites, of course, provide habitat for a diversity of fishes and invertebrates. In addition, they protect shorelines, stabilize sediments, and contribute to water clarity. The habitats are interrelated because organisms using one habitat might utilize another as a feeding or resting area.

The continental shelf off the east coast is narrow (40 km at Cape Canaveral, 1 at Palm Beach, and 13 at Key West). The Florida Keys archipelago begins in southern Biscayne Bay and arcs southward and westward to the Dry Tortugas. The sediment-covered shelf off the west coast is wide (up to 240 km of drowned karst topography). The bottom is irregular being marred by solution basins and sinkholes. An exception is the Florida Middle Ground, an area of great relief with pinnacles reaching up to 13 meters above the bottom.

Most of east Florida's shelf is covered with sand down to Biscayne Bay. In the Keys, the sediment is mostly carbonate sand from mollusks, coralline algae, etc. Off west Florida, the world famous "barking sands" of high quartz content were probably deposited during a period of lower sea level. Sand along the east coast is derived from land sources and carried southward by longshore currents. Florida Bay is dominated by calcareous mud and slits, much of it skeletal remains of bivalve mollusks and foraminiferans.

Significant food is available on the continental shelf. Worldwide, all big fisheries are found in this area. Species diversity is particularly high in Florida. Florida's lengthy shoreline and coastal habitats provide habitat for **over 1000 species of marine and estuarine fishes--one quarter of the entire number recorded for the northern portion of the Western Hemisphere!!!** This great diversity is partly due to Florida's location in a climatic transition zone. The waters contain both temperate fishes (and invertebrates) from the Carolinian Marine Province and tropical elements from the Caribbean West Indian Province.

The best Known and most profitable benthic or demersal fishery in Florida is the commercial pink shrimp industry. Other species taken include scallops, clams, conchs, stone crabs, flounders, croakers, tilefish, pompano, permit, bonefish, saltwater catfish, stingrays, and pinfish.

Live Bottom--This is a term used to describe bottoms where gorgonians, sponges, hydroids, anemones, corals and other organisms accumulate. This type of habitat provides excellent cover for fishes. Therefore, these are the major areas where we fish and SCUBA. Valuable food fishes found here include: sea basses, groupers, snappers, porgies, grunts, amberjacks, and triggerfish. Commercial sponges occur here also.

Oculina coral reefs--Unusual reefs or living deep water corals occur off the eastern coast at depths of 70-100 meters. These reefs consist entirely of bushy thickets of a single species--the ivory tree coral, ***Oculina***. The coral supports a diverse and dense association of invertebrates which in turn support a dependant group of commercially valuable fishes.

Worm rock reefs--Sabellariid worms from large colonies cemented together with sand grains from the intertidal area to about 10 meters. A steady supply of sand is required for this activity; so you won't see these structures past Biscayne Bay. Spiny lobsters, snappers, groupers and a variety of fishes seek the protection of these interesting structures.

Vermetid worm snail reefs--Wormlike shell masses of the snail, ***Petaloconchus***. These reefs located on the lower west coast are now dead, but they were living in the 1890's. The reason for their death is unclear.

Mangrove rock reef--The only known example of fossilized mangroves is found near Bear Cut on Key Biscayne.

Tropical coral reefs--Communities found off southeast Florida are the only shallow water coral reefs found in North American waters. These are covered in detail in another section.

Artificial habitats--Bridges, piers, wrecks, pipelines, etc.

Fishery resources--Oceanic Pelagic. Important fishery species off Florida include the billfishes (sailfish, white and blue marlin, and swordfish), oceanic tunas (bluefin, yellowfin, bigeye, and skipjack tunas), dolphin fish, and sharks.

Fishery resources--Oceanic Neritic. Important species in the neritic environment include: the mackerels (king mackerel and Spanish mackerel), cobia, little tunny, and bluefish. Other important species include neritic clupeids such as Spanish sardines and thread herring, jacks, blackfin tuna, and ballyhoo. Mullets and menhadens spawn in the neritic, but they spend much of their life in the estuaries.

L303--FACT SHEET--**MANGROVE ECOSYSTEMS**

The word-mangrove-has a complex etymology. It may have been derived from the Portuguese word for tree, mangue, and the English word for trees, grove. Other possible origins include the Malay--manggi or Taino--mangle. The word mangrove refers to a phylogenetically separate group of tropical salt tolerant trees. As a group, they are the **most numerous trees in the world**. In south Florida, mangroves serve two distinct roles: They serve as a habitat for juvenile fishes and they provide an enormous supply of leaf material (detritus) which is a source of energy for a detritus-based food web supporting numerous invertebrate species or small forage fish species that are food for other fish.

Four mangrove species are recognized in Florida: red mangrove (***Rhizophora mangle***), black mangrove (***Avicennia germinans***), white mangrove (***Laguncularia racemosa***), and buttonwood (***Conocarpus erecta***). Buttonwood is most often associated with the first three species at the transition zone to upland areas, and frequently contributes to the overall biomass but not in quantities comparable to other species.

Because they are phylogenetically unrelated, mangroves have solved the problem of salt tolerance in differing ways. They are subjected to a continual buffeting by the waves, and a tropical sun that beats down seemingly 100% of the time.

Red mangroves--These are generally the most seaward of the three species. They are easily recognized by their strong arching prop roots. Try to pull one of these suckers out of the mud, and you'll appreciate why they are a first line of defense against storms. The velocity of the waves really slows down as they go through the mangroves. As in the mudflats, the oxygen environment is low around the mangroves. Look for dots called lenticels on the roots which permit gasseous exchange, but which close when the water comes in. Some salt enters which is collected in leaves which are continually sacrificed to the environment. Look for orange leaves that are ready to be dropped. In emergency situations, the leaves can be used as a source of tobacco and/or tea. Normal leaves are bright green and waxy in appearance (to prevent desiccation). Reproduction of the red mangrove is in the Spring with the seed or propagule germinating directly on the trees (a characteristic of true mangroves). The pencil-shaped propagules reach a length of up to 18 inches, hanging conspicuously from the branches in late summer. The seeds float parallel out of the system and then float around

upright for a year. The seed is actually a germinated plant ready to take hold in the appropriate location.
Black mangroves--The black mangrove usually grows landward of the red. The blacks seem to be the hardiest of the species being somewhat resistant to cold and very resistant to salt. The black mangrove has a network of horizontal cable roots which give rise to characteristic finger-like **pneumatophores** arising from the soil around the plant. The pneumatophores allow for direct absorption of oxygen into the roots. The black mangrove apparently needs fresh water for photosynthesis; therefore, the salt is excreted onto the side of the leaf prior to the water entering the photosynthetic system. The leaves tend to be more pointed and gray. Rub the back of a leaf and taste the salt that's been excreted. Fruits of the black mangroves are lima bean-shaped--about an inch long. Bees seem to like the flowers; therefore, the species contributes to a great deal of honey production.

White mangroves--This plant has rounded, yellow green leaves with salt glands on the petiole. White mangrove seeds look something like dried raisins.

Buttonwood--These mangroves have pointed leaves with salt secreting cells all down the midrib. General characteristics are a rough bark and buttonlike seeds. The tree, in the past, was regarded as a source of charcoal. An ornamental variety--the silver buttonwood--is used as a hedge or yard plant in the Keys.

Estimates of total acreage occupied by mangrove communities in Florida vary widely between 430,000 to over 650,000 acres.

These systems provide a significant input of energy into the ecosystem. The leaves eventually are broken down releasing tannic acid around the roots which may protect the system from shipworms and gribbles. It is the detritus or fragments of leaves, stems, twigs, roots, fruits, and seeds and the associated bacteria and fungi that forms the basis of the energy flow in the mangrove food webs.

First, the detritus is fragmented, consumed, and excreted by a number of consumers beginning with small crustaceans such as amphipods, caridean shrimps, xanthid crabs leading through a relatively simple food web which includes small fish and then to secondary consumers like gray snapper, tarpon, snook, red drum and spotted sea trout. See the attached figure for a general breakdown.

Mangroves in Florida are extremely vulnerable to man-induced perturbations. They are a protected habitat requiring both state and federal permits for excavation or filling in the vicinity of the trees.

L303--FACT SHEET--**SEAGRASS MEADOWS**

Florida has an estimated 800,000 acres of seagrasses. The dominant species are turtle grass-***Thalassia testudinum***, manatee grass-***Syringodium filiforme***, and shoal grass-***Halodule wrightii***. The majority of these grasses are found in the Keys in Florida Bay down into the Dry Tortugas. The seagrasses are land type plants in that they have both flowers and seeds; however, they are pollinated underwater. Turtle grass can't grow on hard rock; so on the reef you'll find it in back areas or in potholes where sediment has accumulated.

Seagrasses are tremendous producers of carbon. The epiphytic algae attached to the seagrasses also contribute significantly to the energy flow within the system. In addition to providing a source of food, the seagrasses by a process of "winnowing up" stabilize the sediments in a particular area thereby providing a habitat for benthic fauna.

Seagrass meadows control or modify the ecosystem in the following ways. First, they provide food for a very limited number of organisms such as parrotfishes, surgeonfishes, queen conchs, sea urchins and some nudibranchs. Green sea turtles originally utilized the resource leading to the general use of the name. Second, the grasses serve as hosts for epiphytes which are used or skimmed off by mullet and snails. Next, large and significant quantities of detritus from dead grasses are the beginning of the food chain. The binding of the sediments listed above preserves the microbial flora and prevents erosion.

The limiting factor for seagrass growth is available sunlight. They don't grow well in areas where there is a lot of turbidity and siltation. Normally, you don't find these grasses below 30 feet. Also they are very susceptible to the action of storms. After a storm, you sometimes find 3 or 4 feet of beach wrack piled up on the shore. Herbivores also detach the blades. The turtle grass blades are straplike and the bite of a parrotfish or urchin will only remove a portion of the blade. However, a bite on the round manatee grass always will severe the blade, and the portion above the bite will float to the surface and drift away. This is why a major portion of the beach wrack is often manatee grass. Turtle grass doesn't float that well and sort of moves along the bottom. Turtle grass blades have been photographed in very deep water--3900 meters.

Major vertebrate consumers of the seagrasses include turtles and manatees. Neither is abundant these days, but occasionally one observes turtles mowing down large tracts of grass. The small grassbed parrotfish is ***Sparisoma radians***. You might find all the types of sea urchins in the grassbeds. Sea urchins graze upon the outer region of the leaf which has ceased growing, but which is often heavily colonized by epiphytes of high food value.

A great many other animals utilize the area. Some 113 epiphytic forms counted included several mollusks. The mollusk counts have been suggested to approach 95 billion per square mile. The grasses also provide physical protection for small resident species like seahorses and transient juvenile species of sport fishes like snook and tarpon. Some have hypothesized that the abundance of the commercial pink shrimp is directly related to areal extent of the sea grasses. The food for these fishes and shrimp comes from a complex community of microalgae, amphipods, rotifers, copepods, and other small animals associated with decaying grasses and their decomposers.

Survival in the grass flat in the Florida Keys is especially difficult. In contrast to the coral reef, **there is really no place to hide**. A great deal of effort is put into not being observed initially. Most organisms are small, drab, or cryptically colored. The sea horse is a prime example of a grass flat organism. Ordinarily, they don't move very quickly. The eyes even move independently of one another. Other fishes are able to avoid detection by using the grass meadows only at night. In Florida, vast schools of snapper and grunts seen in the reefs during the day are apparently only resting. They migrate sometimes over long distances during the night into grass flats to feed. Migration routes to the beds may remain constant for several years.

Large, armor-protected queen conchs, ***Strombus gigas***, eat the turtle grass. Because of overcollection of the shells and meat, they have a collection restriction until at least 1989. The horse conch, a large predatory tulip shell, and the Florida state shell, preys on the queen conch. The horse conch is the largest snail in the United States. The smaller lightning whelk, tulip shells, and apple murex are other examples of predatory gastropods in the grass beds. The lightning whelk is appropriately named because it can literally run down its prey. The apple murex anesthetizes its prey. Often when captured, they smell like rotten cabbage producing a yellow color which turns lavender when dried. I've been told that the Romans used the dye to color the royal robes.

Also, look for sea cucumbers in the grass flats. In Florida, it is estimated that there are 90 tons of sea cucumbers for every 2 square miles. This is an animal you shouldn't collect. The combination of toxins and evisceration will kill the remainder of the collection. ***Carapus***--the pearl fish--lives in the anus of the five-toothed sea cucumber. The names come from the fact that the fish originally was found inside a pearl (and if you believe this, you'll believe anything).

L303--FACT SHEET--**SALT MARSHES**

Salt marshes are intertidal herbaceous plant communities that develop along margins of estuaries where wave energy is low. Essentially, they are a specialized type of wetland.

Florida has three physiographic types of marsh wetlands. 1. Carolinean Marine Province--(Atlantic Coast north of Cape Canaveral). This area is characterized by a temperate biota with some seasonal tropical elements. 2. West Indian--Cape Canaveral south through the Keys and north along the Gulf Coast to Cedar Key. This area has a tropical biota with a few temperate organisms. Coral reefs and mangrove are characteristic features of the Keys. 3. Louisiana-- Gulf Coast north of Cedar Key. Organisms are similar to the Carolinean.

Some 80 to 90% of the Atlantic and Gulf Coasts consists of estuaries and lagoons with **shoreline marshes**. South Atlantic and Gulf coast marshes represent the largest coastal area in the United States. In Florida, mangroves dominate the shoreline areas in the southern part of the state. Grasses, sedges, and rushes characteristic of marshes act as the pioneer community in the mangrove zone, eventually being shaded out by the mangroves. Along the southeast tip of the peninsula, however, large stands of black needle rush, ***Juncus roemerianus***, are associated with the mangroves.

Vegetation in these marshes consists of grasses (Poaceae), sedges (Cyperaceae) and rushes (Juncaceae). The areas are typically intertidal with the same diurnal changes found on the rocky shoreline. However, with their high rates of primary production, marshes are among the most productive natural ecosystems in the world. As with mangrove systems, marsh vegetation fragments (detritus) are an important beginning of estuarine and marine food webs.

The marshes provide habitat and protection for juvenile fishes, birds, and invertebrates. They protect coastal areas from erosion. Briefly, the salt marsh functions in detrital export, nutrient export, sediment trapping, pollutant removal, and the critical habitat for juvenile fishes mentioned above.

Although it is unlikely that we will visit the Atlantic or Gulf Coast marshes, you should be aware of the following: Atlantic marshes are dominated by smooth cord grass, ***Spartina alterniflora***. Gulf

Coast marshes are dominated by black needle rush, ***Juncus roemaerianus***. Only a small portion of the vegetative biomass is converted into herbivore biomass in either area. Aquatic marsh invertebrate detritovores are at the bottom of the dominant food chain.

Juvenile penaeid commercial shrimp are an important marsh component in late spring and summer months. Blue crabs spawn in marshes and the larvae return to the marshes for growth into juveniles. American oyster (the kind we eat) builds intertidal and subtidal reefs in marsh areas. Oysters require a mixture of salt water from the tides and freshwater from land drainage where they filter water taking in phytoplankton, detritus, bacteria, and other particulate matter. A positive relationship between marsh area and oyster production has been established. It is now clear that healthy oysters depend on a viable salt marsh environment.

A substantial portion of the salt marshes of Florida are now under governmental control and protection. But as the population of Florida continually expands, demands for residential and commercial developments near estuary and marsh habitat will be a certainty. It has been estimated that 8% or 60,000 acres of basic estuary habitat has been lost just to dredge and fill operations. Channelization and maintenance of navigation channels also represent a significant alteration in urbanized areas. Many other perturbations including diversion of water, construction of dams, ranchings and farming alter the coastal zone habitats. Hopefully, integrated water basin management plans will include salt marshes and estuaries.

Table 1. Comparison of South Atlantic and Gulf Coast Marshes.

Item	South Atlantic	Gulf Coast
Plant Angiosperms		
Dominant plant	Spartina alterniflora	Juncus roemerianus
High Marsh plant	Salicornia-	S. patens-Distichlis-
Inland Marsh plant	Distichlis-Juncus	Scirpus association
	S. cynosuroides-	S. cynosuroides-
	Typha	P.communis-Cladium
Fauna	association	
Dominant insect		Orchelimum
	Orchelimum	concinnum
Benthic bivalves	fidicinium	Conocephalus spp.
	Prokelisia marginata	
		Polymesoda caroliana
Snails	Modiolus demissus	Modiolus demissus
		Melampus bidentatus
Crabs	Littorina irrorata	Littorina irrorata
Mammals		Uca spp. and Sesarma
	Uca spp. and Sesarma	Ondatra zibethica
Salinity Range	Procyon lotor	Myocastor coypus
Tide Cycle		2-15°/oo
(Amplitude)	10-30°/oo	Diurnal (0.3 m)
Freshwater Input	Semi-diurnal (2.0 m)	
Major River System		Mississippi River
Annual Precipitation	Savannah River	40 cm
Primary Productivity	120 cm	1500-3000 $g/m^2/yr$
Secondary	1000-2000 $g/m^2/yr$	
Productivity		55,193 tonnes
Penaeid Shrimp yield	5,964 tonnes	(33.9 kg/ha)
	(13.2 kg/ha)	790,625 tonnes
Total fish yield	144,245 tonnes	(485.4 kg/ha)
	(320.2 kg/ha)	1,628,900 ha
Size of intertidal areas	450,500 ha	

L303--FACT SHEET--**Coral Reefs**

Coral reefs are shallow water, tropical marine ecosystems of biological origin characterized by a tremendous variety of plants and animals and high rates of production in nutrient-poor and plankton-impoverished tropical ocean water. **Tropical coral reef communities found off southeast Florida are the only shallow-water coral reefs found in North American waters.** They are similar to Caribbean coral reefs. Their existence this far north is a result of the moderating influence of the Florida Current and the availability of substrate for coral development.

The Keys and the remainder of the Atlantic were very much affected by the Pleistocene glaciation when the water cooled and the was lowered by maybe as much as 600 feet. These factors drastically reduced the number of coral species in the Atlantic. Currently, only 50 species of hermatypic (reef building) corals thrive in the Atlantic. The Pacific has some 80 genera and 700 species.

Corals are comprised of thousands of minute organisms called coral polyps (Cnidarian Class Anthozoa, Order Madreporaria or Scleractinia). In the hermatypic or hard corals, these tiny animals remove calcium carbonate from the water and form the reef. The other active components of the reef in the Keys are the fire corals (especially ***Millepora complanata***) and some calcareous red algae of the coralline group.

Coral reefs are essentially a three-dimensional limestone framework which creates numerous niches for a diverse sedentary and mobile fauna. **Biological activity here has been described as being similar to a tropical rain forest with high species interactions like symbiosis, high gross primary productivity, and very rapid recycling of limiting factor nutrients like nitrogen and phosphorus. Most primary production is situated within the symbiotic algae with the coral tissue (zooxanthellae).**

In Florida, two major reef types are recognized, **inshore patch reefs and offshore bank reefs**. Patch reefs within sedimentary and seagrass communities are usually constructed by star and brain corals (***Monastraea annularis***, ***Siderastrea siderea***, and ***Diploria***. As noted below, the backbone of the Keys was an historic patch reef which over time built up to a thickness of 300 feet in some areas. Because this substrate is at present topographically low and porous, there is hardly any freshwater in the Keys. The

water is piped in from the north. The exception to this is Big Pine Key where a lens of Miami oolite overlies the Key Largo limestone. Patch reefs are normally irregularly shaped without a classic zonation pattern noted so often in the literature. Gorgonians like seawhips, plumes, feathers, and fans are often a conspicuous element in the patch reefs.

Bank reefs are normally 5-7 miles offshore and linearly parallel the Keys. Some like Looe Key possess well-defined biological zonation patterns controlled by depth, light, and wave force. Looe Key also is one of two reefs in the Keys with a spur and grove or finger and groove system with sand channels in between the coral formations. The shallowest part of the system is the reef flat which bears the brunt of the waves surging up through the finger and groove structures at Looe Key. Dead coral rubble, fire coral (do not touch), and some turtle grass may be found here. Near the top of the shallow portion of the spur and groove system, note the fire corals and mats of zoanthid or Cheerio coral. The spur and groove consists of a series of alternating ridges and channels. In this area, the ridges have a lot of elkhorn coral (***Acropora palmata***). Grooves are filled with sand and coral rubble. Look for mountainous star coral-***Montastraea annularis***-the major reef builder in the buttress zone in about 15 feet of water.

How can corals live in areas that are relatively low in nutrients? First, a relatively narrow set of environmental conditions must be met.

1. A hard surface or a previous coral reef for settlement and attachment of larvae to initiate development of the reef. Some corals in the Keys like rose coral and finger coral tolerate some turbidity and live in sandy areas, but they do not form reef structures.

2. Massive reef builders are only found in the tropics where the temperatures average 23-25° C. The reef distribution is shifted upward into Florida from the tropics because of the above noted ction of the Florida Current.

3. Full-strength seawater with a salinity of 32 to 42 parts per thousand. They have little or no tolerance to low salinities, nor do they like turbidity.

4. Major reef building occurs in shallow water from 5 to 150 feet. They require light for the development of the zooxanthellae.

Reefs are most often conspicuously arranged roughly parallel to the shore with the seaward edge in the direction of the prevailing winds demonstrating the most active growth. In Florida and particularly the Bahamas, the bank or platform type of fringing reef is often characterized by the spur and groove system mentioned above. The flow of water through these grooves is important in channeling water onto the reef and in the transport of nutrients and organic matter. In general, the Gulf of Mexico is a poor place for reef development Little bedrock is available; most of the Gulf rocks off Florida's Gulf Coast is covered with a sediment veneer. Notable exceptions are the Middle Grounds mentioned earlier and the Flower Gardens way out in he Gulf.

5. Zooxanthellae (endozoic dinoflagellate algae symbionts) living in the coral tissue. The highly modified dinoflagellates are in some way associated with the rapid growth of corals. The corals may feed on the photosynthetic products of the algae; the algae may play a significant role in calcium precipitation.

Coral Biology Facts-(1) Growth rate-young colonies grow faster than older ones; branched faster than massive (1 foot every 28 years in mountainous star coral--a massive form; staghorn coral can grow as fast as 4 inches a year). (2) Corals reproduce sexually producing a free swimming planular and Edwardsia larvae and asexually by budding. In extratentacular budding, each polyp forms its own cup. Brain corals bud along the entire length of the polyp. (3) Predators include snails and nudibranchs, polychaete worms, a few barnacles, crabs and major coral crushers like the parrotfish. The major and best known coral predator lives in the Pacific-the crown-of-thorns starfish. (4) Feeding is at night. Polyps extend their tentacles at night securing zooplankton as food for themselves and their symbiotic zooxanthellae. During day, the algae photosynthesize thus becoming the major source of primary production on the reef. (5) Little phytoplankton is around, but you should look for several types of benthic algae like ***Halimeda*** and ***Penicillus*** which are also carbonate secreting. (6) Although nutrients in the water are consistently low, those in the reef system are tenaciously retained conservative, regenerative, and recycling mechanisms. (7) Secondary production comes from autochthonous production inside the system rather than materials transported in. Read the seagrass section for an exception to the statement. Grunts resting over the elkhorn corals positively stimulate the coral growth with their release of waste products. (8) Diversity is high because of the wide variety of habitats generated by the coral structures.

Fish Observed by the 1991 Field Biology Class

_x_ Ocean surgeon
___ Flamefish
_x_ Scrawled filefish
_x_ Gray angelfish
_x_ Foureye butterfly
___ Wrasse blenny
_x_ Masked goby
_x_ Bermuda chub
_x_ Creole wrasse
_x_ Puddingwife
_x_ Gray snapper
_x_ Spotted goatfish
_x_ Brown chromis
_x_ Bicolor damselfish
_x_ Porkfish
_x_ Smallmouth grunt
_x_ French grunt
_x_ Princess parrotfish
_x_ Rainbow parrot
___ Redfin parrotfish
_x_ Highhat
_x_ Butter hamlet
___ Black grouper
_x_ Jolthead porgy
_x_ Nurse shark
_x_ Southern stingray
_x_ Green moray
_x_ Trumpetfish
___ Longspine Squirrelfish
_x_ Fairy basslet
___ Marbled grouper
_x_ Greater soapfish
_x_ Bluerunner
_x_ Lane snapper
_x_ Sailor's choice grunt
_x_ Spotted goatfish
_x_ Gray triggerfish
_x_ Scrawled cowfish
_x_ Flyingfish
_x_ Anchovies
_x_ Mojarras
_x_ Dolphinfish
___ Sargassumfish
___ Green turtle
_x_ Loggerhead turtle
___ Hawksbill turtle

_x_ Doctorfish
___ Belted cardinalfish
_x_ Slender filefish
_x_ French angelfish
_x_ Spotfin butterfly
_x_ Redlip blenny
___ Goldspot goby
_x_ Spanish hogfish
_x_ Hogfish
_x_ Bluehead wrasse
_x_ Mahogany snapper
_x_ Glassy sweeper
_x_ Yellowtail damsel
_x_ Threespot damsel
_x_ Spanish grunt
_x_ Blue parrotfish
_x_ Queen parrotfish
___ Bucktooth parrot
___ Reef croaker
_x_ Graysby
_x_ Harlequin bass
_x_ Great barracuda
___ Bonnethead
_x_ Southern stingray
_x_ Spotted moray
___ Sand tilefish
___ Reef Squirrelfish
_x_ Shy hamlet
___ Tiger grouper
_x_ Graysby
_x_ Greater amberjack
_x_ Mutton snapper
_x_ Cottonwick grunt
_x_ Spotted drum
_x_ Spotted trunkfish
___ Whitespotted filefish
___ Lesser electric ray
___ Pinfish
___ Scorpionfish
_x_ Blackfin tuna
_x_ Rainbow runner
_x_ Dusky squirrelfish
_x_ Yellowfin mojarra
_x_ Jewfish
_x_ Night sergeant
_x_ Sharksucker

_x_ Blue tang
_x_ Trumpetfish
_x_ Bar jack
_x_ Rock beauty
_x_ Saddled blenny
_x_ Neon goby
___ Hovering goby
_x_ Slippery dick
___ Clown wrasse
_x_ Schoolmaster snapper
_x_ Yellowtail snapper
_x_ Sergeant major
_x_ Dusky damselfish
_x_ Cocoa damselfish
_x_ Tomtate
_x_ White grunt
___ Bluelip parrotfish
___ Striped parrotfish
_x_ Redband parrotfish
_x_ Stoplight parrot
___ Blue hamlet
_x_ Red grouper
___ Lantern bass
_x_ Sharpnose puffer
_x_ Sharksucker
_x_ Yellow stingray
___ Snook
_x_ Houndfish
_x_ Tobaccofish
_x_ Bigeye
___ Yellowmouth grouper
___ Coney
___ African pompano
_x_ Vermillion snapper
_x_ Tripletail
_x_ Atlantic spadefish
_x_ Smooth trunkfish
___ Striped burrfish
_x_ Ballyhoo
_x_ Lined seahorse
___ Sheepshead
___ Little tunny
_x_ Hammerhead shark
_x_ Almaco Jack
_x_ Cobia

___ Barred cardinalfish
_x_ Orangespotted filefish
_x_ Queen angelfish
_x_ Reef butterfly
___ Roughhead blenny
___ Bridled goby
_x_ Herrings
_x_ Yellowhead wrasse
___ Blackear wrasse
_x_ Mutton snapper
_x_ Yellow goatfish
_x_ Blue chromis
_x_ Beaugregory
_x_ Black margate
_x_ Caesar grunt
_x_ Bluestriped grunt
_x_ Midnight parrot
_x_ Redtail parrotfish
___ Jackknife fish
___ Barred hamlet
___ Sand tiger shark
_x_ Nassau grouper
___ Tarpon
_x_ Saucereye porgy
___ Sand diver
_x_ Squirrelfish
___ Blackbar soldierfish
___ Glasseye snapper
___ Red hind
_x_ Yellowjack
_x_ Permit/pompano
___ Dog snapper
_x_ Margate
_x_ Redspotted hawkfish
_x_ Porcupinefish
___ Balloonfish
_x_ Needlefish
_x_ Mullet
___ Lookdown
___ King mackerel
_x_ Blacktip shark
_x_ Bigeye scad
_x_ False pilchard
_x_ Sharksucker
_x_ Pipefish
_x_ Mosquitofish

REQUIRED FISH LIST
FIELD BIOLOGY

LEARN TO RECOGNIZE THE FOLLOWING FISHES AND THEIR FAMILIES. THEY COMPRISE OVER 80% OF THE FISH IN REEF AREAS.

ORECTOLOBIDAE--nurse sharks
Ginglymostoma cirratum--nurse shark
DASYATIDAE--stingrays
Dasyatis americanus--southern stingray
Urolophus jamaicensis--yellow stingray
MURAENIDAE--morays
Gymnothorax funebris--green moray
BELONIDAE--needlefishes
Tylosaurus crocodilus--houndfish
EXOCOETIDAE--flyingfishes and halfbeaks
Hemiramphus brasiliensis--ballyhoo
FISTULARIIDAE--cornetfishes
Fistularia tabacaria--bluespotted cornetfish
AULOSTOMIDAE--trumpetfishes
Aulostomus maculatus--trumpetfish
HOLOCENTRIDAE--squirrelfishes and soldierfishes
Holocentrus ascensionis--squirrelfish
Holocentrus rufus--longspine squirrelfish
Holocentrus coruscus--reef squirrelfish
Myripristis jacobus--blackbar soldierfish
SERRANIDAE--seabasses
Epinephelus striatus--nassau grouper
GRAMMISTIDAE--soapfishes
Rypticus saponaceus--greater soapfish
LUTJANIDAE--snappers
Lutjanus apodus--schoolmaster
Lutjanus griseus--gray snapper
Lutjanus synagris--lane snapper
Ocyurus chrysurus--yellowtail snapper
PRIACANTHIDAE--bigeyes
Priacanthus cruentatus--glasseye snapper
APGONIDAE--cardinalfish
Apogon maculatus--flamefish
CARANGIDAE--jacks, scads, and pompanos
Caranax ruber--bar jack
Caranx bartholomaei--yellow jack
Caranx crysos--blue runner
GERRIDAE--mojarras
Eucinostomus argenteus--spotfin mojarra

POMADASYIDAE--grunts
Haemulon flavolineatum--french grunt
Anisotremus virginicus--porkfish
SCIAENIDAE--drums
Equetus acuminatus--highhat drum
MULLIDAE--goatfishes
Mulloidichthys martinicus--yellow goatfish
Pseudupenus maculatus--spotted goatfish
KYPHOSIDAE--sea chubs
Kyphosus sectatrix--bermuda chub
CHAETODONTIDAE--butterfly fishes
Chaetodon capistratus--four eye butterflyfish
C. ocellatus--spotfin butterflyfish
C. sedentarius--reef butterflyfish
C. striatus--banded butterflyfish
POMACANTHIDAE--angelfishes
Holacanthus bermudensis--blue angelfish
H. ciliaris--queen angelfish
H. tricolor--rock beauty
Pomacanthus paru--french angelfish
P. arcuatus--gray angelfish
POMACENTRIDAE--damselfishes
Abudefduf saxatilis--sergeant major
Chromis cyanea--blue chromis
Pomacentrus fuscus--dusky damselfish
P. variabilis--cocoa damselfish
P. partitus--bicolor damselfish
P. planifrons--three spot damselfish
Microspathodon chrysurus--yellowtail damselfish
LABRIDAE--wrasses
Bodianus rufus--spanish hogfish
Lachnolaimus maximus--hogfish
Halichoeres garnoti--yellowhead wrasse
H. bivittatus--slippery dick
Thalassoma bifasciatum--bluehead wrasse
SCARIDAE--parrotfishes
Sparisoma viride--stoplight parrotfish
Scarus vetula--queen parrotfish
S. croicensis--striped parrotfish
ACANTHURIDAE--surgeonfishes
Acanthurus chirurgus--doctorfish
A. bahianus--ocean surgeon
A. coeruleus--blue tang
GOBIIDAE--gobies
Gobiosoma oceanops--neon goby

SCORPAENIDAE--scorpionfishes
Scorpaena plumieri--spotted scorpionfish
SPHYRAENIDAE--barracudas
Sphyraena barracuda--great barracuda
BALISTIDAE--triggerfishes
Balistes vetula--queen triggerfish
B. capriscus--gray triggerfish
MONACANTHIDAE--filefishes
Aluterus scriptus--scrawled filefish
A. schoepfi--orange filefish
OSTRACIIDAE--trunkfishes
Lactophrys quadricornis--scrawled cowfish
L. trigonus--truckfish
TETRADONTIDAE--puffers
Canthigaster rostrata--sharpnose puffer
DIODONTIDAE--porcupinefishes
Diodon histrix--porcupinefish
Chilomycterus schoepfi--striped burrfish

1991 Species

Green Algae

_x_Disk Algae, *Halimeda*
Caulerpa
_x_Sea grapes
_x_Sea feathers
_x_Mermaid's fan, *Udotea*
___Sea bottles, *Valonia*
___Green bubble algae,
Dictyosphaeria
_x_Neptune's shaving
brush, *Penicillus*
_x_Gigantic shaving
brush, *P. dumentosus*
_x_"Mossy algae",
Cladophoropsis
___Dead man's fingers,
Codium
___*Avrainvillea*
_x_Mermaid's wine glass,
Acetabularia

Brown Algae

___Strap browns,
Dictyota
_x_Brown whorls and
fans, *Padina*
_x_Gulfweed, *Sargassum*

Red Algae

___Goniolithon,
coralline, crunch, crunch
___*Eucheuma*, cartilage
___Red coralline, *Jania*
_x_Fragile coralline,
Amphiroa
_x_*Laurencia*

Higher Plants

Sea grasses
_x_Turtle grass
_x_Manatee grass
_x_Shoal grass
Mangroves
_x_Red mangrove
_x_White mangrove
_x_Black mangrove
_x_Buttonwood

Salt strand plants

_x_Sea purslane
_x_Saltwort
_x_Glasswort
_x_Sea oxeye
_x_Railroad vine
_x_Sea grapes
_x_Gumbo limbo
_x_Spanish bayonet
_x_Australian pine
_x_Sea oats
_x_Saw palmetto
_x_Prickly pear cactus
_x_Brazilian pepper
_x_Cabbage palm
_x_Spanish needles
_x_Puncture vine
_x_Strangler fig
_x_*Melaleuca*, paper or
punkwood tree
___Beach sunflower

Sponges

_x_Loggerhead sponge
_x_Vase sponge
_x_Heavenly sponge
___Fire sponge
___Chicken liver sponge
___Stinker sponge
_x_Green sponge
___Sheepswool sponge
_x_Commercial sponge
_x_Tube sponge
___Variable sponge

Cnidarians

Hydrozoans
_x_Portuguese man-o-war
___By the wind sailor
Hydrozoan "coral"
_x_Fire coral
Scyphozoans
_x_Moon jellyfish
_x_Upsidedown jellyfish
Anthozoans
Gorgonians or soft corals
_x_Sea fans
_x_Sea rods
_x_Sea whips
_x_Corky sea fingers
Zoanthid mat anemones
_x_Mat anemone
___Cheerio coral
Actinarians
_x_Pink tipped anemone
_x_Ringed anemone
Hard corals
___Elkhorn coral
___Staghorn coral
_x_Rose coral
_x_Mountainous star
_x_Brain
_x_Starlet corals
_x_Finger corals
_x_Clubbed finger
_x_Tube corals

Comb Jellies

_x_Lobate comb jelly

Annelids

_x_Horned feather worm
___Green bristle worm

Sipunculids

___Peanut worm

Mollusks

Chitons
_x_Fuzzy chiton
___Ischnochiton
Sea hares
_x_Spotted sea hare
Archeogastropod snails
_x_American star
_x_Long-spined star
_x_Nerites
Mesogastropod snails
___Black horn shells
_x_Echinus littorinids
___Flamingo tongue
_x_Stocky cerith
_x_Queen conch
___Hawkwing conch
_x_Beaded periwinkle
___Worm snail
Neogastropods
___Lightning whelks
___Horse conch
_x_True tulip
_x_Caribbean vase
_x_Florida rock snail
Pulmonate snail
___Striped false limpet
_x_Keyhole limpet
Bivalves
___Stiff pen shell
_x_Turkey wing
_x_Lister's tree oysters
_x_Tulip mussel
_x_Lucines
_x_Cockles
Cephalopods
___Octopus
_x_Reef squid

Bryozoans

___Whorled zoobotryon

Arthropods

_x_Horseshoe crab
Barnacles
_x_Ribbed
___Fragile or starred
___Ivory
_x_Gooseneck
Stomatopods
___Mantis shrimp
___Swollen claw squilla
Isopods
_x_Sea roach
Amphipods
_x_Beach hoppers
Penaeid shrimp
_x_Commercial pink
Caridean shrimp
___Grass shrimp
___Bumblebee shrimp
_x_Snapping shrimp
Lobsters
_x_Florida spiny
_x_Spanish or
shovelnosed
Hermit crabs
_x_Giant hermit
___Land hermit
_x__Striped hermit
Mole crab
___Emerita
Portunid crabs
_x_Blue crab
Xanthid crabs
___Common mud crab
_x_Stone crab
Grapsoid crabs
_x_Mottled shore crab
___Mangrove crab
Ghost and fiddler crabs
_x__Ghost crab
_x__Fiddler crab
Spider crabs
_x__Arrow crab
_x__Spider crab
_x__Decorator crab
____Two-horned spider

Echinoderms

Sea Stars
___Cushion stars
___Thorny and spiny
Sea urchins
___Long spined
___Pencil
___Sea egg
___Variegated
_x_Rock boring
___Sea bisquits
Brittle stars
___Slimy brittle star
___Basket starfish
Sea cucumbers
___Florida sea cucumber
Sea squirts
_x_Black tunicate

Vertebrates

Fish--Separate List
Birds--Separate List
Mammals
___Whales
_x_Dolphins
_x_Key deer
_x_Raccoons
_x_Smallest gray squirrel
_x_Rats
Herps
_x_Brown anole
_x_Green anole
___Bahamian curlytail
_x_Geckos
___Crocodile
_x_Alligator
___Marine toad
___Other toads
_x_Tree frogs

Insects & other Inverts

Butterflies
See separate list
Dragonflies
___Arrowhead damsel
___Forktail damsel
___Keys red
___Red-faced
___Antillean green-faced
___Marine
___Olive-faced
___Black-headed red
___White-faced
___Violet-faced
___Cosmopolitan
___Red and green-faced
_x_**Mosquitoes bigger than cars**
_x_**Palmetto bugs** = roaches

KINGDOM PLANTAE, DIVISION CHLOROPHYTA, CLASS CHLOROPHYCEAE

GREEN ALGAE

1. THE HALIMEDAS

Halimeda opuntia=cactus Halimeda; often calcified with numerous branches running in different planes. 2-3 lobes. Look for branches running in different planes.
Halimeda incrassata. Thick, heavily calcified. 1 plane of growth. 3 lobes and ribbed. Look for 3 lobes and ribs.
Halimeda monile. Flat segments with a rounded upper joint. Look for flat segments with a rounded upper joint.
Halimeda tuna. One plane. Large flat, round to kidney-shaped joints. Look for large, flat kidney-shaped or round joints.

2. THE CAULERPAS

Caulerpa sertularioides. Open sandy areas. Beautiful with long feathery blades.
Caulerpa paspaloides. Four brushes on a stalk. Triangular in appearance.
Caulerpa racemosa. Found clinging to rock. Clusters of small green grapes.

3. PENICILLUS=SHAVING BRUSH ALGAE

Penicillus capitatus=Neptune's shaving brush. Distinctive.
Penicillus dumentosus=Large shaving brush. Distinctive.
Avrainvillea--Looks like shaving brush, but is large and fanlike. Dark brown to black in color.

4. UDOTEA=MERMAID'S FAN

Udotea flabellum=Mermaid's fan. Sandy areas and grass beds. Broadly fan-shaped on a short stalk.

5. ACETABULARIA=MERMAID'S WINEGLASS

Acetabularia crenulata=Mermaid's wineglass. Very distinctive.

6. CODIUM=DEAD MAN'S FINGERS

Codium taylori. Glistening green fingers or tubes.

7. VALONIA=SEA BOTTLES

Valonia ventricosa=Sea bottles. Elliptical, transparent sacs.

Dictyosphaeria cavernosa--Green bubble algae. Look for a large, green sphaerical mass growing in the intertidal and below

Cymopolia--Distinctive, unusual algae with tubular calcareous joints. Each branch ends in a tuft of green filaments

KINGDOM PLANTAE, DIVISION PHAEOPHYTA, CLASS PHAEOPHYCEAE

BROWN ALGAE

Dictyota dichotoma--Flat straplike branches always branching dichotomously.

Padina sanctaecrucis--Curled, fanlike branches from a single stalk.

DIVISION PHAEOPHYTA, CLASS PHAEOPHYCEAE

SARGASSUM OR GULFWEED

Sargassum filipendula--Gulfweed is familiar to everyone who has walked the beach or seen the floating masses at sea. This form, one of 15 or more species, is golden brown and found growing attached to the rocks in the Keys.

KINGDOM PLANTAE, DIVISION RHODOPHYTA, CLASS RHODOPHYCEAE

Laurencia papillosa--This red alga is often found growing along the edges of rocky platforms. It is densely clustered, olive-green to greenish purple. The branches have small tubercles.

KINGDOM PLANTAE, DIVISION RHODOPHYTA, CLASS RHODOPHYCEAE

CORALLINE RED ALGAE

The corallines are reds so heavily calcified that they have lost their resemblance to algae.

Goniolithon--Forms hard encrustations on coral and rock. We'll see a form at West Summerland Key that becomes masses of closely entangled thin branches. This form is mistaken for coral.

Amphiroa fragilissima--Slender coralline branchlets. As with the above, they go "crunch, crunch" under the foot.

Jania rubens--red coralline. Rose red, delicate, with a height of 1-2 inches.

Kingdom Plantae, Salt Strand Plants. Look for these plants living at the water's edge.

Batis maritima--Saltwort. Look for a pale green, succulent shrub. Crushed leaves give off a scent.

Sesuvium portulacastrum--Sea purslane. Succulent plants mostly lying on the ground.

Salicornia--Glasswort. Fleshy, shrubby. Crackle under the foot.

Kingdom Plantae, The Sea Grasses

Thalassia testudinum--Turtle grass. Look for larger flat blades.

Syringodium filiforme--Manatee grass. Look for round blades.

Halodule wrightii--Shoal grass. Look for smaller flat blades.

Kingdom Plantae, The Mangroves. An ecological rather than taxonomic designation. These are trees adapted for living in saltwater environments.

Conocarpus--Buttonwood. Shaggy bark often with a twisted trunk. Leaves a pale grayish green. My general impression is that they are narrower and more sharply pointed than the other mangroves.

Laguncularia--White mangrove. Rounded leaves with indented tips. A pair of swollen salt glands at the base of the leaf.

Rhizophora mangle--Red mangrove. Smooth leathery leaves. Prop roots. Distinctive seedling.

Avicennia germinans--Black mangrove. Lanceolate leaves. Characteristic aeration roots called pneumatophores.

Kingdom Animalia, Phylum Porifera, Class Demospongiae

Spheciospongia vesparia--Loggerhead sponge

This is the largest sponge I have seen. Usually with a cake shape and a flat top and central depression. The dark holes at the top are called oscula. The species is the host of many marine animals--especially snapping shrimp.

Kingdom Animalia, Phylum Porifera, Class Demospongia

Ircinia campana--Vase sponge.
Phylum Cnidaria, Class Hydrozoa, Order Hydroida

CNIDARIA

This phylum includes jellyfish, sea anemones, hydrozoans, and corals. Although extremely variable in appearance, all members have a radially symmetrical body plan. The saclike body has a central stomach cavity with a single opening that is usually surrounded by food-capturing tentacles.

Classification of major reef benthic Cnidaria

PHYLUM CNIDARIA (COELENTERATA)

CLASS HYDROZOA

ORDER MILLEPORINA: fire corals

ORDER STYLASTERINA: hydrocorals

CLASS ANTHOZOA

SUBCLASS OCTOCORALLIA (ALCYONARIA) *sensu* Bayer 1961

ORDER STOLONIFERA

ORDER TELESTACEA

ORDER ALCYONACEA: fleshy soft corals

ORDER GORGONACEA: sea whips, sea feathers, sea fans, sea plumes, other gorgonian corals
ORDER PENNATULACEA: sea pens

SUBCLASS ZOANTHARIA (HEXACORALLIA)

ORDER ACTINIARIA: anemones

ORDER CORALLIMORPHARIA: false coral anemones

ORDER ZOANTHIDEA: carpet anemones

ORDER CERIANTHARIA: tube anemones, often parasitic in other organisms

ORDER SCLERACTINIA (MADREPORARIA): true stony corals

ORDER ANTIPATHARIA: black or thorny corals

Kingdom Animalia, Phylum Cnidaria, Class Scyphozoa
Cassiopeia xamachana--Upsidedown jellyfish. Distinctive. Lies upside down to provide necessary sunlight to farm algae.
Aurelia aurita--Moon jellyfish. Commonly washed ashore. Look for it in the water column around the reefs and grass flats.

Class Anthozoa, Order Zoanthidea
Zoanthus pulchellus--Mat anemone. Matlike pretty bluish to greenish colonies attached to rocks at low tide line.
Palythoa mammillosa--Knobby zoanthidean or "cheerio coral". Form on dead coral in the reef zone.

Kingdom Animalia, Phylum Cnidaria, Class Anthozoa, Subclass Alcyonaria

Pterogorgia anceps--Angular sea whip. Triangular with beautiful purple color. This is the common soft coral at West Summerland Key.

Kingdom Animalia, Class Anthozoa, Subclass Alcyonaria

Gorgonia ventalina--Common sea fan

Flat anastomosed colony; usually purple in appearance. This one is fairly common around the reefs in the keys.

Kingdom Animalia, Phylum Ctenophora

Mnemiopsis mccradyi--Lobate comb jelly.

These transparent jellies are often found by the thousands in shallow water. Often they are bioluminescent at night.

Phylum Cnidaria, Class Anthozoa, Subclass Zoantharia, Order Madreporaria

Manicina areolata--Rose coral. The small coral is one that you will find close to shore. Can tolerate some turbidity.

Siderastrea--Starlet coral. Look for small clumps in shallow areas. The rounded masses may reach one to two feet in diameter.

Kingdom Animalia, Phylum Annelida.

Green bristle worms

Look for a squarish body, greenish color, orange-red gills. Handle this one with care--if at all. The bristles easily penetrate gloves to cause painful stings.

Feather worms

Look for single opening of tube which is glued together with pieces of leaves, mangrove detritus etc.

Kingdom Animalia, Phylum Mollusca, Class Polyplacophora

Ischnochiton papillosus--Slender, white chiton found at West Summerland Key.

Acanthopleura granulata--Fuzzy chiton. Girdle with low, hairlike spines.

Kingdom Animalia, Phylum Cnidaria, Class Anthozoa, Subclass Zoantharia, Order Actinaria

Condylactis gigantea--Pink-tipped anemone. The tentacles are always tipped in pink or blue.

Kingdom Animalia, Phylum Bryozoa

Zoobotryon verticillatum--Whorled Zoobotryon. These animals form masses resembling algae on shoreline structures.

Kingdom Animalia, Phylum Mollusca, Class Gastropoda, Subclass Opisthobranchia.
Aplysia dactylomela--spotted sea hare. Distinctive. Punch it and watch it emit clouds of deep purple ink.

Phylum Arthropoda, Class Crustacea, Subclass Malacostraca, Order Amphipoda, Orchestia--beach hoppers

Kingdom Animalia, Phylum Chordata, Subphylum Tunicata, Class Ascidiacea Ascidia nigra--Black tunicate. Easily recognized by its blue to black test.

Kingdom Animalia, Phylum Arthropoda, Class Crustacea, Subclass Malacostraca, Order Isopoda.
Ligia exotica--Sea roach. Runs rapidly over rocks or sea walls.

Kingdom Animalia, Phylum Sipunculida
Phascolosoma antillarum--Peanut worm. Remarkable powers of extension and scrunching up. Bores into soft beach rock.

Phylum Arthropoda, Class Merostomata, Limulus polyphemus--horse-shoe crab. Familiar to all sandbar waders and beach walkers. Actually the horse-shoe crab is more related to spiders than to crabs.

Class Crustacea, Subclass Malacostraca, Order Stomatopoda

The mantis shrimp or squillas are often called "thumbsplitters" because they can use their raptorial claws to inflict a nasty wound.
Phylum Arthropoda, Class Crustacea, Subclass Malacostraca, Order Decapoda, Suborder Natantia, Section Penaeidea

Penaeus duorarum--The commercial pink shrimp has characteristic grooves running along the carapace.

Caridean shrimp like the grass shrimp, Tozeuma, have a second or abdominal segment which overlaps both the preceding plate and the one behind.

Phylum Arthropoda, Class Crustacea, Subclass Malacostraca, Order Decapoda Suborder Natantia, Section Caridea

The Bumblebee shrimp lives on sea urchins in grassy areas. It has a cutoff look. The entire body is covered with deep chocolate bands separated by narrow yellow lines.

The common snapping shrimp is recognized by the red splotch at the end of the large claw. You can hear the snaps at night or around loggerhead sponges where these species often fill up the galleries and holes in the sponge.

Phylum Arthropoda, Class Crustacea, Subclass Malacostraca, Order Decapoda,

Suborder Reptantia, Division Palinura

Panulirus argus--Florida spiny lobster, crawfish, "bug"

Scyllarides--Spanish or shovel-nosed lobster
Phylum Arthropoda, Class Crustacea, Subclass Malacostraca, Order Decapoda,

Suborder Reptantia, Division Anomura

Clibanaris vittatus--Striped hermit crab. Noticeable gray to white stripes on the legs.

Emerita talpoida--Mole crab. Catches the waves in the swash zone to grab detritus. It then quickly burrows back into the sand.

Phylum Arthropoda, Class Crustacea, Subclass Malacostraca, Order Decapoda, Suborder Reptantia, Division Anomura

Coenobita clypeatus--Land hermit crab. One of the few terrestrial hermit crabs. Purple left claw with orange dactyls.

Petrochirus diogenes--Giant hermit crab. Look for this monster in conch shells. The scaly chelipeds are diagnostic.
Phylum Arthropoda, Class Crustacea, Subclass Malacostraca, Order Decapoda
Suborder Reptantia, Division Brachyura--True Crabs

Crancoid crabs--Oval to circular in shape with spines on the anterior end.

Family Portunidae--Portunidae crabs are swimmers because the last appendage is modified into a paddle.

Grapsoid crabs are squarish with no or insignificant spines.

The ghost crab is the most common crab along the beaches--especially in the evening. The overall color is the color of a tan sand beach.

The mangrove or tree crab is small--about an inch. Look for a patch of hairs on the claws. Carapace turned inward posteriorly. Color on moveable claw extends back into palm. These are true crabs in the Family Xanthidae.

Panopeus is the common mud crab. Watch these. They have massive claws that can pinch the Hell out of you.

Menippe is the commercial crab you've heard so much about. The young are bluish purple with a white spot on the wrist.
This is the common fiddler crab. Rough claw with no ridge. Also known as the mottled shore crab. The little crab has a converging posterior with tubercular lines on its carapace. The claws are smooth.

The Spider Crabs of the Superfamily Oxyrhyncha

The Arrow crab is a distinctive little crab which crawls slowly over the bottom.

Look for the big spider crabs in shallow water. The rostrum ends in two points. There are six spines on each side.

The grass crab or sponge crab is a type of "decorator crab". It attaches all sorts of objects to its rostrum and back. Sponges often grow on its back. Look for three spines at the rear.

The 2-horned spider has a spotted cheliped--even in alcohol..Spines at the angles are small.

Phylum Echinodermata, Class Asteroidea

Cushion star--Bright red starfish. Our best known starfish. Overcollected in many areas.

Phylum Echinodermata, Class Echinoidea, Subclass Regularia

Sea Urchins.

Both of the above are easily recognized. Look for long black spines and don't stick your hand or foot in the "Antillean crown of thorns".

Look for blunt spines in the slate-pencil urchin. You can pick this one up.

Phylum Echinodermata, Class Echinoidea, Subclass Regularia

Find an urchin with objects attached to its back, and you have found a variegated urchin. It is a master at camouflage.

The sea egg is distinctive with short white spines on a brown test.

Phylum Echinodermata, Class Echinoidea, Subclass Regularia

The Rock-boring urchin is elliptical in outline with strong, thick pointed spines. Look for in holes along the tide line.

Subclass Irregularia--Sea biscuits and sand dollars.

There are not many sand dollars in the Keys.

The sea biscuit is oval on top, but it is flattened underneath. This one is common in several habitats.
Basket starfish--Distinctive and easily recognized. Look for clinging to sea fans etc. By day, they may be curled into a tight knot.
Phylum Echinodermata, Class Ophiuroidea--Brittle Stars.

Vegetation Observed by the 1991 Field Biology Class

Common Name	UK	LK
____sweet acacia	—	P
____pineland acacia	--	P
____torchwood		H
____pond apple	H	P
____marlberry	H	P
____crabwood	H	--
__x_black mangrove	H	H
____false willow	--	P
____groundsel tree	—	H
____groundsel tree	H	H,P
____smooth strongbark	--	P
____strongbark	H	H
____rough strongbark	H	--
____saffron plum	H	H,P
____willow bustic	**H**	**H,P**
__x_gumbo limbo	**H**	**H,P**
____locust berry	H	H,P
____beauty berry	H	--
____pale lidflower	H	--
____myrtle-of-the-river	H	--
____cinnamon-bark	H	--
____Jamaica caper	H	--
____limber caper	H	H
____seven-year apple	H	--
____Bahama senna	—	H,P
__x_coco plum	H	P
____satinleaf	H	H,P
____fiddlewood	H	--
____pitch apple	—	H
____pigeon plum	**H**	**H,P**
__x_sea grape	H	H,P
____soldierwood	H	-
__x_buttonwood	H	H,P
__x_Geiger tree	H	H
____rhacoma	H	H,P
____pineland croton	—	P
____cupanla	—	H
____varnish leaf	H	--
____milkbark	H	H,P
____Guiana plum	H	--
____black torch	H	H,P
__x_white stopper	H	H,P
____redberry stopper	H	--
____Spanish stopper	H	H,P
____red stopper	H	--
____princewood	H	H
____inkwood	H	H
__x_strangler fig	**H**	**H,P**
____shortleaf fig	H	H,P
____pineland olive	—	P
____lignum vitae	H	--
____blolly	H	H,P
____velvetseed	H	H,P
____rough velvetseed	H	H,P
____fslse boxwood	—	H
____scarletbush	H	H
____manchineel	—	H,P
____white ironwood	H	P
____joewood	H	H,P
____black ironwood	**H**	

Vegetation continued

__x_white mangrove	H	H,P
____wild sage	H	H,P
__x_wild tamarind	**H**	**--**
____wild dilly	H	H,P
____mastic	**H**	**--**
____gutta-percha mayten	H	--
__x_poisonwood	**H**	**H,P**
____twinberry stopper	H	--
____wax myrtle	—	H,P
__x_myrsine	H	H,P
____lancewood	H	--
____red bay	H	P
__x_S. Fla, slash pine	—	H,P
__x_Jamaica dogwood	**H**	**H,P**
____pisonia	--	H,P
____blackhead	—	P
__x_cat's claw	H	H
____long-stalked stopper	—	H,P
____Bahama wild coffee	H	--
__x_live oak	H	--
____indigo berry	H	H,P
____darling plum	H	H,P
__x_red mangrove	H	H,P
____sumac	—	P
____soapberry	H	--
____maiden bush	—	H
____Florida boxwood	H	--
____gray twig	H	--
____paradise tree H	H	
____Bahama nightshade	H	--
____potato-tree	H	H,P
____necklace pod	—	P
__x_mahogany	**H**	**--**
____West Indies trema	H	--
____Florida trema	—	H,P
____pearl berry	H	--
____tallowwood	H	H
____wild lime	H	--
____yellow nicker	—	H
__x_gray nicker	H	--
____snowberry	H	H
____fishpoison vine	H	--
____chew stick	H	--
____doctor vine	H	--
__x_Virginia creeper	H	H
____devil's claw	H	H
____greenbrier	H	H,P
____soldier vine	H	H
__x_poison ivy	H	H,P
____muscadine	H	H
__x_silver palm	H	H,P
____buccaneer palm	H	-
__x_royal palm	—	—
__x_cabbage palm	H	H,P
__x_saw palmetto	H	H,P
__x_Key thatch palm	H	H,P
__x_Florida thatch palm	H	H,P

Cultivated, Exotic and Otherwise Interesting

__x__Ants, No fire ants in the Keys
__x__No-see-ums, small flies that pack a big bite

Flowering trees
__x__Tree of Gold, Yellow poui or silver trumpet
__x__Royal poinciana
____African tulip
____Orchid tree
____Pitch apple
____Shaving brush
____Woman's tongue
____Powder puff
____Mahoe
__x__Oleander
____Mango
__x__Fragipani
____Golden-rain tree
__x__Geiger tree
__x__Jacaranda
__x__Acacia
__x__Schefflera
____Bottle brush
____Lignum vitae
____Yellow poinciana
____Jerusalem thorn
____Pink shower tree
____Golden shower tree
__x__Papaya
____Sausage tree
__x__Norfolk Island Pine
__x__Banyan=common name for 800 species of fig trees with multiple trunks
__x__Rubber tree=Ficus
__x__Strangler fig tree

Shrubs
__x__Hibiscus
__x__Oleander
__x__Poinsettia
__x__Yellow allamanda
__x__Bougainvillea
__x__Crotons
____Dumb cane
__x__Periwinkle

Cacti
__x__Prickly Pear
__x__Dildo cactus
____Climbing tree cactus
__x__Agave or Sisal
__x__Aloe plants
__x__Spanish bayonet

Flowers
__x__Moses in the bulrushes
____Wedelia
____Chenille, red-hot cattail
__x__Coral plant
____Crown of thorns
__x__Firecracker plant
__x__Bird of paradise
__x__Lantana
____Gaillardia or blanket flower
____Moon flower
__x__Morning glory
____Caesar's weed
__x__Wild pine
__x__Spider lily
__x__Citrus, oranges, lemons, limes and grapefruit

Bad Exotics
__x__Australian pine
__x__Brazilian pepper
__x__Melaleuca or paper tree

Roadside
____Beggar's ticks
__x__Puncture vine
__x__Morning glory
__x__Love vine
____Caesar's weed
____Castor bean
__x__Periwinkle
__x__Life Plants
__x__Wandering jew
__x__Saltbush
__x__Sandbur
__x__Spanish needles
__x__Wild poinsettia
__x__Poison ivy
____Grapes
____Rosary pea

Ferns
__x__Cabbage palm fern
____Strap fern
__x__Bracken fern
____Zamia or coontie--a cycad
____Resurrection ferns
____Leather fern

Snails
__x__Tree snails

Orchids and airplants
__x__Spanish moss
____Ball moss
__x__Wild pine or cardinal air plant
____Orchids

Other
__x__Christmas tree palm
__x__Senegal date palm

Plant List for Field Biology Fresh Water Swamps and Wetlands

Common Name	*Scientific Name*	Family
Air plants or Bromeliads	*Tillandsia (11 spp.)*	Bromeliaceae Pineapple Family
Alligator Flag or Arrowroot	*Thalia geniculata*	Marantaceae Arrowroot Family
Arrowhead	*Sagittaria (7 spp.)*	Alismataceae Water plantain
Bald Cypress	*Taxodium distichum*	Taxodiaceae Bald Cypress Family
Bladderwort	*Utricularia (5 spp.)*	
Bog Hemp or Wild Hemp Vine	*Mikania (3 spp.)*	Asteraceae (Compositae) Aster Family
Butterfly Orchid	*Encyclia tampensis*	Orchidaceae Orchid Family
Cattail	*Typha (3 spp.)*	Typhaceae Cattail Family
Duckweed	*Lemna (2 spp.)*	Lemnaceae
Elderberry	*Sambucus simpsonii*	Caprifoliaceae
Hat Pin or Pipewort	*Eriocaulon (3 spp.)*	Eriocaulaceae Pipewort Family
Leather Fern	*Acrostichum (2 spp.)*	Pteridaceae Bracken Fern Family
Milkweed Vine or Climbing Milkweed	*Cynanchum (4 spp.)*	Asclepeadaceae Milkweed Family
Milkweed	*Asclepeas (12 spp.)*	Asclepiadaceae Milkweed Family
Mosquito Fern	*Azolla caroliniana*	Salviniaceae
Paper Tree or Punkwood	*Melaleuca quinquinervia*	Myrtaceae (introduced Myrtle Family from Australia)
Pennywort	*Hydrocotyle (3 spp.)*	Apiaceae Celery Family
Pickerel Weed	*Pontedaria lanceolata*	Pontederiaceae Pickerelweed Family
Pond Apple	*Annona glabra*	Annonaceae Custard Apple Family
Primrose Willow	*Ludwigia peruviana*	Onagraceae Evening Primrose Family

Common Name	Scientific Name	Family
Red Bay and Swamp Bay	*Persea (2 spp.)*	Lauraceae Laurel Family
Red Maple	*Acer rubrum*	Aceraceae Maple Family
Royal Palm	*Roystonea elata*	Arecaceae (Palmae) Palm Family
Saw Grass	*Cladium jamaicensis*	Cyperaceae Sedge Family
Spanish Moss	*Tillandsia usneoides*	Bromeliaceae Pineapple Family
Spatterdock or Yellow Water Lilly	*Nuphar luteum*	Nymphaeceae Water Lilly Family
Spider Lilly	*Hymenocallis (2 spp.)*	Amaryllidaceae Amaryllis Family
Spike Rush	*Eleocharis (7 spp.)*	Cyperaceae Sedge Family
Swamp Fern	*Blechnum serrulatum*	Blechnaceae Blechnum Family
Swamp Lilly	*Crinum americanum*	Amaryllidaceae Amaryllis Family
Water Arum	*Peltandra virginica*	Arum Family Araceae
Water Fern	*Salvinia rotundifolia*	Salviniaceae
Water Hyacinth	*Eichornia crassipes*	Pontederiaceae (Introduced from South America) Pickerelweed Family
Water Lettuce	*Pistia statiotes*	Araceae Arum Family
Water Lilly	*Nymphaea (3 spp.)*	Nymphaeaceae Water Lilly Family
Wax Myrtle or Bayberry	*Myrica (2 spp.)*	Myricaceae Bayberry Family
Willow	*Salix caroliniana*	Salicaceae Willow Family

Plant List for Field Biology Coastal Vegetation-Dunes-

Common Name	*Scientific Name*	Family
Australian Pine	*Casuarina (3 spp.*	Casuarinaceae (Introduced from Austrailia) Beefwood Family
Beach Bean or Bay Bean	*Canavalia maritima*	Leguminosae (Fabaceae)
Beach Peanut	*Okenia hypogaea*	Bean & Pea Family
Beach Sunflower	*Helianthus debilis*	Nyctaginaceae Four O'clock Family
Century Plant	*Agave (3 spp.)*	Asteraeae (Agavaceae Agave Family
Cocoplum	*Chrysobalanus icaco*	Chrysobalanaceae
Greenbrier	*Smilax (4 spp.)*	Smilacaceae Smilax Family
Ground Cherry	*Physalis (5 spp.)*	Solanaceae Nightshade Family
Heliotropes	*Heliotropium (3 spp.)*	Boraginiaceae
Inkberry	*Scaevola plumieri*	Goodeniaceae
Necklacepod	*Sophora tomentosa*	Fabaceae Pea & Bean Family
Poisonwood	*Metopium toxiferum*	Anacardiaceae Cashew Family
Poor Mans Patches	*Mentzelia floridana*	Loasaceae
Prickly Pear Cactus	*Opuntia (6 spp.)*	Cactaceae Cactus Family
Puncture Weed	*Tribulus cistiodes*	Zygophyllacae Caltrop Family
Railroad Vine or Beach Morning Glory	*Ipomoea pes-caprae*	Convolvulaceae Morning Glory Family
Saw Palmetto	*Serenoa repens*	Palmae (Arecaceae) Palm Family
Sea Grape	*Cocoloba uvifera*	Polygonaceae Buckwheat Family
Sea Oats	*Uniola paniculata*	Poaceae (Gramineae) Grass Family
Spanish Bayonet	*Yucca aloifolia*	Agavaceae
Spider Lilly	*Hymenocallis (2 spp.)*	Amaryllidaceae Amaryllis Family
Tread Softly	*Cnidoscolus*	Euphorbiaceae

Field Biology Animal List

-Gastropods-

Common Name	*Scientific Name*	Habitat
Apple Snail	*Pomacea spp.*	
Tree Snails	*Liguus fasciatus*	

-Spiders-

Common Name	*Scientific Name*	Habitat
Crab Spider	*Gasteracantha cancriformis*	
Golden Orb Weaver	*Nephila clavipes*	
Orchard spiders	*Leucauge spp.*	

-Insects-

Common Name	*Scientific Name*	Habitat
Cabbage Butterflies	*Various genera & species*	
Honey Bee	*Apis mellifera*	
Monarch Butterfly	*Danaus plexippus*	
Paper Wasp	*Polistes sp.*	
Queen Butterfly	*Danaus gilippus*	
Swallowtails	*Papilio spp.*	
Sulfur Butterflies	*Var. genera & species*	
Viceroy Butterfly	*Basilarchia archippus*	
Zebra Butterfly	*Heliconius charitonius*	

Field Biology Animal List

-Amphibians-

Common Name	*Scientific Name*	Habitat
Giant Toad	*Bufo marinus*	
Southern Toad	*B. terrestris*	
Tree Frogs	*Hyla (5 spp. inc. green & squirrel)*	
True Frogs	*Rana (2 spp. pig & leopard)*	

-Reptiles-

Common Name	*Scientific Name*	Habitat
Brown Anole	*Anolis sagrei*	
Green Anole	*A. carolinensis*	
Bahamian Curly Tail Lizard	*Leiocephalus carinatus*	
Southeastern Five-Lined Skink	*Eumeces inexpectatus*	
Alligator	*Alligator mississippiensis*	
Florida Softshell Turtle	*Trionyx ferox*	
Water Snakes	*Natrix (3 spp.)*	
Cotton Mouth or Water Mocccasin	*Agkistrodon piscivorous*	
Coral Snake	*Micrurus fulvius*	
Pigmy Rattlesnake	*Sistrurus miliarius*	
Eastern Diamondback Rattlesnake	*Crotalus horridus*	

Common Birds of the Florida Keys. Birds observed by the 1991 class are in bold.

___**Brown pelican, APR**
___**Magnificient frigate bird, UPR**
___**Great white heron, CPR**
___Snowy egret, CPR
___Tricolored heron, APR
___**Green-backed heron, APR**
___**White ibis, CPR**
___**Turkey vulture, CPR**
___Bald eagle, RPR
___**Short-tailed hawk, OWR**
___Clapper rail, CPR
___Black-bellied plover, CWR
___Black-necked stilt, UPR
___Lesser yellowlegs, CWR
___**Willet, CPR**
___**Sanderling, CWR**
___Short-billed dowitcher, APR
___**Ring-billed gull, CWR**
___Royal tern, CPR
___**Black skimmer, CWR**
___White-crowned pigeon, CPR
___**Burrowing owl, RPR**
___**Mourning dove, CPR**
___Mangrove cuckoo, UPR
___**Belted kingfisher, CWR**
___Great-crested flycatcher, UPR
___**Barn swallow, CPR**
___Gray catbird, CWR
___European starling
___Black-whiskered vireo, ASR
___Yellow-rumped warbler, CWR
___Blackpoll warbler, CSPT
___Common yellowthroat, CWR
___Bobolink, CT
___**Common grackle, CSR**

___**Double-crested cormorant, APR**
___**Great blue heron, CPR**
___**Great egret, CPR**
___Little blue heron, UPR
___**Cattle egret, APR**
___Yellow-crowned night heron, CPR
___Roseate spoonbill, UPR
___Red-breasted merganser, CWR
___**Osprey, CPR**
___Red-shouldered hawk, CPR
___American kestrel, CWR
___American coot, CWR
___Semipalmated plover, CWR
___**Ruddy turnstone, APR**
___Least sandpiper, APR
___**Laughing gull, APR**
___Herring gull, CWR
___**Least tern, CSR**
___**Street pigeons, CPR**
___Eurasian collared dove, exotic rapidlyincreasing
___**Common ground dove, CPR**
___Antillean night hawk, USR
___**Red-bellied woodpecker, CPR**
___**Blue-gray gnatcatcher, CWR**
___White-eyed vireo, CPR
___Great kingbird, CSR
___**Northern mockingbird, APR**
___Cape-may warbler, CT
___Palm warbler, CWR
___American redstart, CT
___Indigo bunting, CT
___**Red-winged blackbird, CPR**

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A=Abundant
C=Common
U=Uncommon
O=Occasional
P=Permanent
W=Winter
S=Summer
Sp=Spring
R=Resident
T=Transient

Field Biology Animal List

-Birds-

Common Name	Common Name
Brown Pelican	Black-Crowned Night Heron
Cormorant	Yellow-Crowned Night Heron
Anhinga	White Ibis
Turkey Vulture	Gallinules (2 spp. common and purple)
Black Vulture	American Coot
Hawks (7 spp.)	Sea Gulls (Herring, ring-billed, laughing, and boneparte's)
Osprey (fish hawk)	Blue Jay
Black Skimmer	Terns (about 10 spp.)
Kingfisher	Common or American Egret
Great Blue Herron/Great White Heron	Crows (fish and common)
Snowy Egret	Red-winged Blackbird
Cattle Egret	Grackles (common and boat-tailed)
Louisiana Heron	Sandpipers (about 20 spp.)
Little Blue Heron	
Green Heron	
Cardinal	

-Mammals-

Common Names:			
Raccoon	White-tailed deer	O'possum	Armadillo
Marsh Rabbit	Key deer	Eastern Fox Squirrel	
	Eastern Grey Squirrel		

Plant List for Field Biology

Scrub Forests

Common Name	*Scientific Name*	Family
Lichens (Terrestrial)		
Lovevine	*Cassytha filiformis*	Lauraceae Laurel Family
Oak	*Quercus sp*	Fagaceae Beech Family
Prickly Pear Cactus	*Opuntia (6 spp.)*	Cactaceae Cactus Family
Rosemary	*Ceratiola ericoides*	Empetraceae Crowberry Family
Sand Pine	*Pinus clausa*	Pinaceae Pine Family
Spike "Moss"	*Selaginella (4 spp.)*	Selaginillaceae Spike Moss Family

Coastal Vegetation

-Mangroves-

Common Name	*Scientific Name*	
Australian Pine	*Casuarina (3 spp.)*	Casuarinaceae (Introduced from Austrailia) Beefwood Family
Black Mangrove	*Avicennia germinans*	Avicenniaceae
Red Mangrove	*Rhizophora mangle*	Rhizophoraceae Mangrove Family
Buttonwood	*Conocarpus erecta*	Combretaceae
White Mangrove	*Laguncularia racemosa*	Combretaceae
Cordgrass	*Spartina (4 spp.)*	Poaceae (Gramineae)

-Strand-

Common Name	*Scientific Name*	Family
Brazilian Pepper	*Schinus terebinthifolius*	Anacardiaceae (Introduced from S. America) Cashew Family
Coconut Palm	*Cocos nucifera*	Aracaceae (Palmae) Palm Family
Dalbergia	*Dalbergia (3 spp.)*	Fabaceae (Leguminosae) Pea and Bean Family

	-Strand-	
Glasswort	*Salicornia (2 spp.)*	Chenopodiaceae Goosefoot Family
Leather Fern	*Acrostichum (2 spp.)*	Pteridaceae Bracken Fern Family
Nickerbean	*Caesalpinia (3 spp.)*	Leguminosae (Fabaceae) Pea and Bean Family
Saltbush	*Baccharis (4 spp.)*	Compositae (Asteraceae) Aster Family
Saltwort	*Batis maritima*	Bataceae Saltwort Family
Sea Ox-eye or Sea Daisy	*Borrichia (2 spp.)*	Compositae (Asteraceae) Aster Family
Sea Purslane	*Sesuvium (2 spp.)*	Aizoaceae Carpetweed Family

Plant List for Field Biology
Pine Flatwoods

Common Name	*Scientific Name*	Family
Beauty Berry	*Callicarpa americana*	Verbenaceae
Blueberry	*Vaccinia myrsinites*	Ericaceae Heath Family
Bracken Fern	*Pteridium aquilinum*	Pteridaceae Bracken Fern Family
Brazilian Pepper	*Schinus terebinthifolius*	Anacardiaceae (Introduced from S. America) Cashew Family
Cabbage Palm	*Sabal palmetto*	Aracaceae (Palmae) Palm Family
Cabbage Palm Fern or Golden Polypody	*Phlebodium aureum*	Polypodiaceae Polypody Fern Family
Fetterbush	*Lyonia lucida*	Ericaceae Heath Family
Gallberry	*Ilex glabra*	Aquifoliaceae Holly Family
Greenbrier	*Smilax (4 spp.)*	Smilacaceae Smilax Family
Heliotropes	*Heliotropium (3 spp.)*	Boraginiaceae
Lovevine	*Cassytha filiformis*	Lauraceae Laurel Family
Marlberry	*Ardesia escalloniodes*	Myrsinaceae Myrsine Family
Partridge Pea	*Cassia fasciculata*	Leguminosae (Fabaceae) Pea & Bean Family
Penny Royal	*Satureja rigida*	Lamiaceae Mint Family
Poison Ivy	*Toxicodendron radicans*	Anacardiaceae Cashew Family
Saw Palmetto	*Serenoa repens*	Palmae (Arecaceae) Palm Family
Slash Pine	*Pinus elliottii*	Pinaceae Pine Family
Staggerbush	*Lyonia ferruginea*	Ericaceae Heath Family
Swamp Fern	*Blechnum serrulatum*	Blechnaceae

Plant List for Field Biology
Hammocks and Tree Islands

Common Name	*Scientific Name*	Family
Air Plants or Bromeliads	*Tillandsia (11 spp.)*	Bromeliaceae Pineapple Family
Beauty Berry	*Callicarpa americana*	Verbenaceae
Boston Fern	*Nephrolepis (3 spp.)*	Davalliaceae (Intro Pantropical)
Brazilian Pepper	*Schinus terebinthifolius*	Anacardiaceae (Intro S. America) Cashew Family
Butterfly Orchid	*Encyclia tampensis*	Orchidaceae Orchid Family
Cabbage Palm	*Sabal palmetto*	Aracaceae (Palmae) Palm Family
Cabbage Palm Fern or Golden Polypody	*Phlebodium aureum*	Polypodiaceae Polypody Fern Family
Citrus	*Citrus (7 spp.)*	Rutaceae (Intro S. E. Asia) Rue Family
Cocoplum	*Chrysobalanus icaco*	Chrysobalanaceae
Coral Bean	*Erythrina herbaceae*	Leguminosae (Fabaceae) Bean & Pea Family
Florida Holly or Dahoon Holly	*Ilex glabra*	Aquifoliaceae Holly Family
Greenbrier	*Smilax (4 spp.)*	Smilacaceae Smilax Family
Guava	*Psidium guajava*	Myrtaceae (Intro Tropical America) Myrtle Family
Gumbo Limbo	*Bursera simaruba*	Burseraceae Torchwood Family
Mahogany	*Swietenia mahogoni*	Meliaceae (West Indian)
Mastic	*Mastichodendron foetidissimum*	Sapotaceae Sapodilla Family
Marlberry	*Ardesia escalloniodes*	Myrsinaceae Myrsine Family
Moon Flower or Morning Glory	*Ipomoea (2 spp.)*	Convolvulaceae Morning Glory Family
	Ipomoea (14 spp.)	Convolvulaceae (includes moonflower and railroad vine)
Myrsine	*Myrsine guianensis*	Myrsinaceae

Papaya	*Carica papaya*	Caricaceae Papaya Family
Passion Flower	*Passiflora (5 spp.)*	Passifloraceae Passionflower Family
Pigeon Plum	*Cocoloba diversifolia*	Polygonaceae Buckwheat Family
Poison Ivy	*Toxicodendron radicans*	Anacardiaceae Cashew Family
Poisonwood	*Metopium toxiferum*	Anacardiaceae Cashew Family
Red Bay and Swamp Bay	*Persea (s spp.)*	Lauraceae Laurel Family
Snowberry	*Chiococca alba*	Rubiaceae Madder Family
Spanish Moss	*Tillandsia usneoides*	Bromeliaceae Pineapple Family
Stopper	*Eugenia (5 spp.)*	Myrtaceae Myrtle Family
Strangler Fig	*Ficus aurea*	Moraceae Mulberry Family
Swamp Fern	*Blechnum serrulatum*	Blechnaceae Blechnum Fern Family
Virginia Creeper	*Parthenocissus quinquefolia*	Vitaceae Grape Family
Wild Coffee	*Psychotria (4 spp.)*	Rubiaceae Madder Family
Wild Grape	*Vitis (4 spp.)*	Vitaceae Grape Family
Wild Lime	*Xanthoxylem fagara*	Rutaceae

Plant List for Field Biology
Cultivated Plants

Common Name	*Scientific Name*	Family
Australian Pine	*Casuarina (3 spp.)*	Casuarinaceae (Intro Austrailia) Beefwood Family
Banana	*Musa sapientum*	Musaceae
Brazilian Pepper	*Schinus terebinthifolius*	Anacardiaceae (Intro S. America) Cashew Family
Citrus	*Citrus (7 spp.)*	Rutaceae (Intro S. E. Asia) Rue Family
Coconut Palm	*Cocos nucifera*	Aracaceae (Palmae) Palm Family
Life Plant	*Bryophyllum pinnatum*	Crassulaceae (Intro Africa) Orpine Family
Mango	*Mangifera indica*	Anacardiaceae (Intro Tropical Asia) Cashew Family
Mother-in-laws-tongue or Snake Plant	*Sanseveria thyrsiflora*	Agavaceae Agave Family (Intro S. Africa)
Oleander	*Nerium oleander*	Apocynaceae Oleander Family (Intro Mediterranean)
Periwinkle	*Catharanthus roseus*	Apocynaceae (Intro Africa) Oleander Family
Royal Palm	*Roystonea elata*	Arecaceae (Palmae) Palm Family
Sea Grape	*Cocoloba uvifera*	Polygonaceae Buckwheat Family

Plant List for Field Biology
Disturbed Habitats and Ecotones

Common Name	*Scientific Name*	Family
Australian Pine (Austrailia)	*Casuarina (3 spp.)*	Casuarinaceae Beefwood Family
Balsam Pear or Apple	*Momordica charantia*	Curcurbitaceae Cucumber Family
Beard Grass	*Andropogon (10 spp.)*	Poaceae (Gramineae) Grass Family
Beggar's Ticks	*Desmodium (8 spp.)*	Fabaceae (Leguminosae) Pea Family
Bracken Fern	*Pteridium aquilinum*	Pteridaceae Bracken Fern Family
Brazilian Pepper	*Schinus terebinthifolius*	Anacardiaceae (S. America) Cashew Family
Caesar Weed	*Urena lobata*	Malvaceae Mallow Family
Castor Bean	*Ricinis communis*	Euphorbiaceae (Old World Tropics) Spurge Family
Crowsfoot Grass	*Dactyloctenium aegyptium*	Poaceae (Gramineae) (Eurasia) Grass Family
Dog Fennel	*Eupatorium (2 spp. of dog plus 12 add. spp.)*	Compositae Asteraceae
Foxtail Grass	*Setaria (6 spp.)*	Poaceae (Gramineae) Grass Family
Kalanchoe	*Kalanchoe grandiflora*	Crassulaceae (Old World Tropics) Orpine Family
Lantana	*Lantana (5 spp.)*	Verbenaceae
Life Plant	*Bryophyllum pinnatum*	Crassulaceae (Africa) Orpine Family
Lovevine	*Cassytha filiformis*	Lauraceae Laurel Family
Mother-in-laws tongue (Snake Plant)	*Sanseveria thyrsiflora*	Agavaceae Agave Family (S. Africa)

Paper Tree or Punkwood	*Melaleuca quinquinervia*	Myrtaceae Myrtle Family (Australia)
Periwinkle	*Catharanthus roseus*	Apocynaceae (Africa) Oleander Family
Prickly Pear Cactus	*Opuntia (6 spp.)*	Cactaceae Cactus Family
Puncture Weed	*Tribulus cistoides*	Zygophyllacae
Ragweed	*Ambrosia (2 spp.)*	Compositae (Asteraceae) Aster Family
Rattlebox	*Crotalaria (8 spp.)*	Leguminosae (Fabaceae) Pea and Bean Family
Red Top Grass	*Rhynchelytrum repens*	Poaceae (Gramineae) (Africa) Grass Family
Rosary Pea or Crabs Eye	*Abrus precatorius*	Fabaceae (Leguminosae) Pea and Bean Family
Saltbush	*Baccharis (4 spp.)*	Compositae (Asteraceae) Aster Family
Sandspur or Sandbur	*Cenchrus (7 spp.)*	Poaceae (Gramineae) Grass Family
Spanish Needles	*Bidens pilosa*	Compositae (Asteraceae) Aster Family
Spurge	*Chaemaescyce (18 spp.)*	Euphorbiaceae (Euphorbia) Spurge Family
Wedelia	*Wedelia trilobata*	Asteraceae (Compositae) Aster Family
Wild Poinsettia	*Poinsettia cyathophora*	Euphorbiaceae (Euphorbia) Spurge Family

STUDY OF FISHES ON CORAL REEFS

PART 1. SWIMMING

SHAPE OF BODY IS AN INDICATOR OF LIFE STYLE. LOOK FOR AND IDENTIFY FISHES WITH THE FOLLOWING SHAPES:

1 **FUSIFORM AND TORPEDO**=NORMALLY ASSOCIATED WITH PREDATORS AND PLANKTON FEEDERS (MANAGING STRONG CURRENTS).

2 **SLENDER AND COMPRESSED**=ROWING MOTION WITH PECTORAL FINS;HOVERING AND TURNING.

3. **WINGS**=RAYS WHICH "FLY" THROUGH THE WATER.

4. **SIDE TO SIDE SWEEP**=WATCH FOR JAWS.

TYPES OF SWIMMING STYLES

1. **EEL-FORM** (TECHNICALLY ANGUILLIFORM)=UNDULATIONS OF WHOLE LENGTH OF THE BODY

2. **JACK FORM**=NOSE OF AN AIRCRAFT WITH TAPERED POSTERIOR ENDING IN A FORKED TAIL. ADAPTED FOR ACCELERATION.

3. **TRUNKFISH STYLE**=SCULLING EFFECT AND MOVEMENT OF TAILS

4. **BALISTIFORM STYLE**=UNDULATING DORSALS AND ANAL FINS

LOCOMOTION

Aquatic animals have distinctive shapes and swimming appendages for efficient locomotion in their environments.

PELAGIC FISH
Streamlined "torpedo-shaped" bodies with wide spread "V" or sickle shaped tails, and narrow streamlined fins are adaptations of the fast swimming fish of the open oceans.

REEF FISH
Fish which must be able to maneuver between the coral heads, rocks and plants of their homes usually have bodies flattened from side to side (laterally compressed), with short fan-shaped tails and fins for abrupt, stop and start, darting movements.

BOTTOM DWELLERS
For swimming, undulating or crawling along the bottom, these aquatic animals usually have bodies flattened from top to bottom (dorsal-ventrally depressed). These flat shapes are particularly helpful to animals living in tide pools. Why?

Can you determine where the fish live by their shapes? ow do reef fish use their fins to hover in one spot? Look at the flat fish. It started life as a compressed fish swimming upright, but now lives on the bottom. How is it adapted?

STUDY OF FISHES ON CORAL REEFS

PART 2. EATING

DIVERS RARELY SEE FISH EATING. PART OF THE REASON IS THAT FISH EATING FISH EAT IN THE LOW LIGHT HOURS OF DAWN AND DUSK (CREPUSCULAR). LOOK FOR THESE FEEDING PATTERNS.

1. **GRAZERS**--MOST FISH SEEN DURING THE DAY ARE GRAZERS. WATCH PARROTFISHES, ANGELFISHES, DAMSELFISHES, BUTTERFLYFISHES, SURGEONFISHES, TRUNKFISHES, AND TRIGGERFISHES. THEY CRUISE AROUND THE SURFACE OF THE CORAL EATING ALGAE, MOLLUSKS, WORMS, AND SMALL CRUSTACEANS.

2. PARROTFISH TEETH ARE FUSED TOGETHER IN A CHISEL-LIKE BEAK. THEY BREAK OFF CHUNKS OF CORAL TO EXTRACT ALGAE. THEY SLIDE THE MATERIAL DOWN THEIR THROATS INTO A PHARYNGEAL MILL. THE HARD CORAL IS EXCRETED AS SAND.

3. **HUNTERS**--JACKS, SNAPPERS, AND SEA BASS HAVE LEAN, MUSCULAR BODIES FOR HUNTING AND EATING PREY. DURING THE DAY THOUGH, THEY MAY JUST **PATROL** AMONG POTENTIAL PREY (PARTICULARLY JACKS). WATCH FOR THIS BEHAVIOR. BARRACUDAS WILL MAINTAIN A CERTAIN **DISTANCE** AWAY FROM DIVERS. WATCH FOR THIS.

TRUMPETFISH OFTEN USE OTHER FISH AS SHIELDS OR THEY FLOAT IN A VERTICAL POSITION ALONGSIDE A GORGONIAN. WATCH FOR THIS.

GOATFISHES HAVE BARBELS WHICH THEY GLIDE ALONG THE SURFACE OF THE SAND TO FIND PREY BENEATH THE SURFACE.

TURN OVER A ROCK AND WATCH WHICH FISH EAT THE BRITTLE STARS AND ASSORTED INVERTEBRATES UNDER THE ROCKS.

FEED A VIENNA SAUSAGE TO A MORAY EEL.

4. **PLANKTON OPPORTUNISTS**--HERRINGS, SILVERSIDES AND YOUNG HALFBEAKS SEEN NEAR REEFS FEED ON PLANKTON.

SMALL WRASSE, DAMSELFISH, GRUNTS, SQUIRRELFISH, CARDINALFISH, AND BASS EAT PLANKTON INSTEAD OF HUNTING OR GRAZING. LOOK FOR FORKED TAILS AND LARGE EYES. SOME OF THESE FISHES FEED NOCTURNALLY.

STUDY OF FISHES ON CORAL REEFS

PART 3. COLOR

THE NEW DIVER SEES COLOR FIRST AND REMEMBERS IT THE LONGEST. WHY ARE REEF FISHES SO BRILLIANTLY COLORED? IN GENERAL, THEY MAY SERVE AS SOCIAL SIGNALS FOR **INTRA- AND INTERSPECIFIC SPECIES IDENTI-FICATION.** OTHER PATTERNS ARE FOR CAMOUFLAGE AND MIMICRY, COURTSHIP DISPLAYS, PROTECTION AGAINST A BACKGROUND, AND AGGRESSIVE ENCOUNTERS. LOOK FOR THE FOLLOWING COLOR PATTERNS.

1 IDENTIFY SEVERAL FISHES BY THEIR **MORPHOLOGICAL COLOR STAGE**. THIS IS THE NORMAL ADULT PATTERN.

2 IDENTIFY SEVERAL **JUVENILE COLOR PATTERNS**. CONSULT YOUR FISH GUIDE FOR SOME JUVENILE COLOR PHASES. JUVENILES MAY HAVE DIFFERENT COLOR PATTERNS TO MASK THEIR SPECIES MEMBERSHIP.

3. IDENTIFY THE **SUPERMALES AND FEMALES** OF A PARTICULAR SPECIES. WRASSES AND PARROTFISHES ARE HERMAPHRODITIC FISHES WITH 5 OR 6 COLOR PATTERNS OVER THEIR LIFE.

4 FIND EXAMPLES OF **MIMICRY AND CAMOUFLAGE**. MANY NOVICE DIVERS SEE A BROWN, GREEN, BLUE, OR YELLOW TRUMPETFISH--ALL THE SAME SPECIES.

5 FIND EXAMPLES OF FISHES WITH **VERTICAL BARS**. THESE FISHES BLEND INTO THE BACKGROUND OF THE QUILT-LIKE PATTERN OF CORALS, VEGETATION, AND GORGONIANS ON THE REEF.

6 FIND AN EXAMPLE OF A FISH WITH ANOTHER EYE (**OCELLUS**). THESE MAY PROTECT A FISH FROM PREDATION, OR THEY MAY AID IN SPECIES RECOGNITION.

7 FIND AN EXAMPLE OF A FISH WITH STRIPES. THESE CAN BE FISH THAT ARE FAST SWIMMERS. "NOW YOU SEE ME, NOW YOU DON'T".

8. FIND A FISH WITH **ORNAMENTED EYES**. A MAJORITY OF THE FISHES ON THE REEF HAVE EYE RINGS, EYEBROWS, CONTRASTING BACKGROUNDS ETC..

PROTECTIVE COLOR AND SHAPE

To avoid being seen is an important part of survival for many aquatic animals.

HOW NOT TO BE SEEN

COUNTERSHADING

Pelagic fish which live in the open ocean are darker on the top (making them difficult to see from above against the darker water), and are lighter on the bottom (making them difficult to see from below against the lighter surface).

CAMOUFLAGE

Many marine animals blend in with their surroundings, both in shape and color, and some can even change their color, like the octopus and the flat fish.

DISRUPTIVE COLORATION

Many fish that live in the changing lights and shadows of the shallow waters or reefs have lines or spots which disguise their body shapes and hide the distinctive round shape of their vulnerable eyes. Some even have false eyespots on the rear portions of their bodies to fool predators into thinking they are coming when they are really going. Look for false eye spots on fish. How many stone fish can you find? Some fish like the Garibaldi are brightly colored with no disruptive markings. They do not try to camouflage themselves. Can you find out why?

BOTTOM DWELLERS

The bodies of bottom dwelling animals are usually flattened from top to bottom, and their colors often blend with the bottom, making them very hard to see. Many of the slow moving animals that live on the bottom have hard shells, like the lobster, crab and starfish or have sharp, like the sea urchin, to protect them. Some even have poisonous spines, like the stone fish and the stingray.

Many of the animals you will see in the tide pools do not have eyes, but use their tube feet or tentacles to feel for food.

STUDY OF FISHES ON CORAL REEFS

PART 4. SOCIAL LIFE

FIND THE FOLLOWING SOCIAL INTERACTIONS.

1 **SCHOOLING**. THIS IS THE MOST STRIKING EXAMPLE OF SOCIAL LIVING AMONG FISHES. WATCH THE DISTANCE AMONG THE FISHES. ARE THEY A BODY LENGTH APART? MORE OR LESS?

2 **RESTING AGGREGATIONS**. WATCH FOR GROUPS OF FISHES RESTING IN A PROTECTED CORAL SETTING. USUALLY, THESE ARE FISHES THAT FEED AT NIGHT.

3 FIND A **FISH COLONY**. A GOOD EXAMPLE IS A COLONY OF SERGEANT MAJORS OF ALL SIZES LIVING IN A PARTICULAR LOCATION.

4 LOOK FOR A FISH **PAIR**. THE NOVICE DIVER ALWAYS FINDS BUTTERFLYFISHES AND ANGELFISHES IN PAIRS. MOST OF THESE ARE HAPPILY MARRIED COUPLES.

5 FIND AND STUDY A **DAMSELFISH TERRITORY**. THESE SMALL FISH ARE AMONG THE BRAVEST ON THE REEF.

6 FIND A DAMSELFISH **ALGAE FARM**. MANY DAMSELFISH CULTIVATE AND PATROL A SMALL ALGAE CROP.

7 FIND A FISH WITH A **SAFETY HOLE**. MANY FISH LIVE CLOSE TO A SAFE AREA THEY CAN DIVE INTO WHEN A PREDATOR COMES NEARBY.

8 FIND A NEON GOBY OR JUVENILE FRENCH ANGELFISH **CLEANING STATION**. WATCH THE KINDS OF FISHES WAITING TO BE CLEANED.

9. FIND **SPONGE DWELLING GOBIES**. THESE FISHES FIND PROTECTION WITHIN VASE AND BASKET SPONGES.

BEHAVIORAL OBSERVATION

Pick a minimum of one and a maximum of three fish . Allot 25 minutes for your total observation time. Below are some questions to help you in your observations.

1) IDENTIFY YOUR FISH:

2) QUICK SKETCH:

3) IS YOUR FISH

SCHOOLING -

SOLITARY -

4) IS YOUR FISH EATING? DESCRIBE FEEDING BEHAVIOR. If your specimen is not feeding look at mouth position and form and give possible prey tems. Does your fish eat small/big prey; hard/soft prey; scavenger, predator, grazer?

5) Does your fish exhibit any defense displays? What possible predators might your fish have and how might it avoid being eaten?

6) Describe the fish's coloration. With this in mind describe the fish's habitat

7) Do you notice any special appendages/fin or other adaptations? If so, briefly describe.

8) As you observe the fish, also note any interactions with other animals (fish or invertebrates).

SEASHELL KEY

1. Shell had two halves and you have only half of it (bivalve)
GO TO NUMBER 2

1. Shell is a snail shell and does not have two halves (gastropod)
GO TO NUMBER 11

2. The shell's hinge has a straight row of many tiny, evenly spaced "teeth" GO TO NUMBER 3

2. The shell's hinge does not have "teeth", but may have points or scars where the hinges join; or the hinge may not be visible at all
GO TO NUMBER 4

3. The hinge is straight (and the shell has brown zebra-like stripes) TURKEY WING

3. The hinge is not completely straight (shell is white) ARK SHELL

4. Part of the hinge seems to be rolled outward (and the shell is white with many ribs) ANGEL WING

4. No part of the hinge rolls out GO TO NUMBER 5

5. Shell is much longer than it is high (check diagram for difference between length and width); or may have a wedge shape GO TO NUMBER 6

5. Shell is not much longer than it is high - is it more round or oval
GO TO NUMBER 8

6. Ends of the shell are blunt; shell very rectangular in shape
GO TO NUMBER 7

6. Ends of the shell are rounded; shell is wedge-shaped; shell is no longer than one inch FLORIDA COQUINA

7. Shell is more than four times as long as it is high (and looks like an old-fashioned razor) JACKKNIFE or RAZOR CLAM

7. Shell is less than four times the height (and the beak is almost in the center) TAGELUS

8. Shell has rays — GO TO NUMBER 9

8. Shell does not have rays — GO TO NUMBER 10

9. Hinge line has ears — SCALLOP

9. Hinge line does not have ears — COCKLE

10. Shell is fragile, no hinge is visible, and you can almost see through it JINGLE SHELL

10. Shell is not as above, but has concentric growth rings DOSINIA

11. Shell is fairly flat and dish-like — GO TO NUMBER 12

11. Shell is not as above (more round in cross section) GO TO NUMBER 14

12. Shell is coiled (but only at one end) — GO TO NUMBER 13

12. Shell is not coiled (and is shaped like a small, low cone) LIMPET

13. Shell has a deck or shelf inside — SLIPPER or BOATSHELL

13.

Shell not as above (but has a row of several open holes) ABALONE

14. Shell has visible spire at top (it may be tiny) GO TO NUMBER 15

14. Shell is smooth and has no spire at all GO TO NUMBER 21

15. Aperture is roundish or oval in outline (it is less than twice as long as it is wide) GO TO NUMBER 16

15. Aperture is not round, but is at least twice as long as it is wide GO TO NUMBER 18

16. Shell is compressed and has a deep umbilicus (a large, funnel-shaped hole underneath) SUNDIAL

16. Shell not as above GO TO NUMBER 17

17. Shell is globular (ball-shaped) and has smooth surface MOON SNAIL

17. Shell is top-shaped and dark in color PERIWINKLE

18. Shell has very flattened spire (and is quite thin, with a criss-crossed surface pattern) FIG SHELL

18. Shell not as above GO TO NUMBER 19

19. Shell has knobs on spire (or where spire begins) GO TO NUMBER 20

19. Shell has no knobs on spire OLIVE SHELL

20. Aperture is much wider at the top than the bottom KNOBBED WHELK

20. Aperture is wide all the way down and has a notch at the bottom CONCH

21. Teeth are present inside aperture (and outer lip of aperture curls inward) COWRIE

21. Teeth are not present inside aperture GO TO NUMBER 22

22. Shell has a ridge running at right angles to aperture (and is creme-colored with orange edges)FLAMINGO TONGUE

22. Shell does not have a ridge across its back; but the apex (where the spire should be) has a small hole in it BUBBLE SHELL

Florida Field Trip References

1. Florida Aquatic Habitat and Fishery Resources. Seaman, William, Jr., ed.: 543 pp. Florida Chapter of the American Fisheries Society; 1985.

Good reference written in a non-technical way. Much useful information.

2. Coastal Plants of Florida. A Key to Good Land Management. Bullard, Lacy F., ed.: 38 pp. Florida Department of Agriculture and Consumer Services; 1979.

Useful.

3. Abbott, R. Tucker. Collectible Shells of Southeastern U.S., Bahamas & Caribbean: 64 pp. American Malacologists, Inc.; 1984.

4. Abbott, R. Tucker. A Guide to Field Identification. Seashells of North America: 280 pp. Golden Press; 1968.

Excellent guide.

5. Amos, William H. and Stephen H. Amos. Atlantic and Gulf Coasts. The Audubon Society Nature Guides: 670 pp. Alfred A. Knopf; 1985.

Useful information

6. Anderson, Robert. Guide to Florida Wading Birds: 54 pp. Winner Enterprises; 1985.

7. Austin, Sandra K. Common Plants of Palm Beach and Broward Counties.: 73 pp. Florida Atlantic University Foundation, Inc.

8. Bell, C. Ritchie and Bryan J. Taylor. Florida's Wild Flowers and Roadside Plants: 308 pp. Laurel Hill Press; 1982.

One you shouldn't leave home without.

9. Bergeron, Eugene. How to clean seashells: 32 pp. Great Outdoors Publishing Co.; 1971.

Offers information on the cleaning of a variety of shells.

10. Brayfield, Lelia and William. A Guide for Identifying Fossil Shells and Corals. Brayfield Research Lab; 1986.

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11. Carr, Archie. The Sea Turtle; So Excellent a Fishe: 280 pp. University of Texas Press, Austin; 1984.

Classic reference on sea turtles

12. Chaplin, C. G. Fishwatchers Guide to West Atlantic Coral Reefs: 65 pp. Harrowood Books; 1972.

Waterproof Edition which we use quite a bit. New edition is out, but we haven't purchased it.

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Elementary

15. Duncan, Wilbur H. and Marion B. Duncan. The Smithsonian Guide to Seaside Plants of the Gulf and Atlantic Coasts: 409 pp. Smithsonian Institution Press; 1987.

Does not cover the lower peninsula of Florida. We have problems with just using scientific names beneath the colored photographs.

16. Dunkle, Sidney W. Dragonflies of the Florida Peninsula, Bermuda and the Bahamas: 154 pp. Scientific Publishers; The Sandhill Crane Press, Inc.; 1989.

Great photographs.

17. Fleming, Glenn, Pierre Genelle and Robert W. Long. Wild Flowers of Florida: 96 pp. Banyan Books, Inc.; 1984.

18. Fotheringham, Nick. Beachcomber's Guide to Gulf Coast Marine Life: 124 pp. Lone Star Books; 1980.

A new edition recently came out.

19. Gerberg, Eugene J., and Ross H. Arnetts, Jr. Florida Butterflies: 90 pp. Natural Science Publications, Inc.; 1989.

I like this book, but we have had trouble using it because you have to catch and kill the butterflies to identify them.

20. Greenberg, Idaz and Jerry. Guide to Coral and Fishes of Florida, the Bahamas and the Caribbean: 65 pp. Seahawk Press; 1977.

We use this one all the time. Waterproof.

21. Greenberg, Idaz, Jerry and Simba. Gamefishes of the Tropical Atlantic: Card. Seahawk Press; 1989.

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22. Hall, Francis Wyly. Birds of Florida: 34 pp. Great Outdoors Publishing Co.; 1979.

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24. Hargreaves, Dorothy and Bob. Tropical Trees: 64 pp. Hargreaves Company, Inc.; 1965.

25. Hoese, H. Dickson and Richard H. Moore. Fishes of the Gulf of Mexico, Texas, Louisiana and Adjacent Waters: 327 pp. Texas A & M University Press; 1977.

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26. Hoffmeister, John E. Land from the Sea. The Geologic Story of South Florida: 143 pp. University of Miami Press; 1974.

27. Hotchkiss, Neil. Underwater and Floating-Leaved Plants of the United States and Canada: 124 pp. Bureau of Sport Fisheries and Wildlife; Resource Pub. 44; 1967.

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A helpful addition to the field guides we have. Lazell provides an interesting account of the major species in the Keys.

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We have used this occasionally.

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Good reference for all major ecosystems including coral reef systems.

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Good photographs. We like this one.

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If you can't find it in any of the other books, turn to this. Poorly illustrated. Many line drawings.

40. Romashko, Sandra. The Shell Book: 64 pp. Windward Publishing, Inc.; 1984.

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A fun to read account with oodles of interesting information and references.